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THE FRUITFLIES OF THE
GENUS ANASTREPHA

By

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Entomologist

Division of Insect Identification

Bureau of Entomology and Plant Quarantine



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THE FRUITFLIES OF THE GENUS ANASTREPHA¹

By ALAN STONE,² *entomologist, Division of Insect Identification, Bureau of Entomology and Plant Quarantine*

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¹ Order Diptera, family Euriptidae.

² The preparation of this revision has been greatly facilitated by the assistance rendered by a number of entomological workers and institutions. These, and the principal contribution of each, are as follows:

A. C. Baker, in charge of the Division of Fruitfly Investigations of this Bureau, has given much valuable information in correspondence, and when the writer visited him at his headquarters in Mexico City he made available all material in the collection there, including his segregated new species, for study and description. His associates, W. E. Stone, M. McPhail, and C. C. Plummer, were also very helpful. Mr. Stone accompanied the writer and Nathan Berry on a trip to plantations and markets in the States of Puebla, Vera Cruz, and Oaxaca, where infested fruit could be found, and Mr. McPhail showed him his work in Cuernavaca. The field station at the Hacienda Santa Engracia in Tamaulipas was also visited, and Mr. Plummer gave the writer a number of specimens collected there. The greatest single source of material has been from the rearing and trapping in Panama by members of the staff of the Canal Zone laboratory of this Division, under James Zetek. This included all the known species from Panama, more than half of which are new. L. C. McAllister, Jr., of the same Division, has submitted much valuable material from Puerto Rico. P. A. Hoidale and Nathan Berry, of the Division of Mexican Fruitfly Control, have contributed nearly all the material available from the northern limits of the genus in the Rio Grande Valley, two new species being included. J. H. Montgomery and his associates of the State Plant Board of Florida have collected much material in southern Florida, including three new species. A. da Costa Lima, of the Instituto Oswaldo Cruz, Rio de Janeiro, Brazil, has presented the United States National Museum with cotypes of a number of his species and has generously given information on others. Gregorio Bondar, of the Instituto de Cacau, Bahia, Brazil, has presented the Museum with a number of Costa Lima's species, some from the same rearings as those of the type series. C. H. Ballou, J. E. Wille, L. D. Cleare, and Alan Pickles have submitted material, and the British Museum and the American Museum of Natural History have lent all their undetermined material for study, the former including specimens collected by Bates on the Amazon. Through the kindness of Nathan Banks the collection of the Museum of Comparative Zoology was made available for study, including the types of three of Loew's species. Max Beier, of the Vienna Museum, lent a number of types with permission to make the necessary dissections. A. Malaquin, of the Lille Museum (France), lent the supposed type of *obliqua* with the same permission. Paratypes of several of Hendel's species were lent by E. Günther, of the Dresden Museum. John Smart, of the British Museum, made dissections and comparisons of several of Walker's types and supplied much valuable information on these types. Martin Hering, of the Zoologisches Museum, Berlin, lent a paratype and compared specimens with another one of his species. Finally, the preliminary studies and segregation of new species by the late F. H. Benjamin provided an excellent starting point for this study. To all these students of the group, collectors, and custodians of collections the writer expresses his deep gratitude. Without their assistance the study would have been of little value.

The writer is also indebted to the botanists of the Division of Plant Exploration and Introduction, Bureau of Plant Industry, United States Department of Agriculture, for checking the botanical names of the food plants.

INTRODUCTION

The first attempt to bring together the published information on the species of *Anastrepha* was made by Bezzi (1), in 1909, when he listed 19 species belonging to the genus and gave a key to the species. This paper included 1 new species and 1 new variety, the others having been described by Wiedemann, Walker, Macquart, Schiner, Van der Wulp, and Loew. Previous to this Loew (8) had included a number of species, both old and new, under the genus *Acrotowa*, but gave no key to them. The second key to appear was that of Hendel (6), published in 1914, which contained 34 species, including a number of new ones. The genus then remained untouched until 1934, save for the description of a few new species by Aldrich, Bezzi, Knab, Townsend, Sein, and Lutz and Costa Lima. In that year appeared a revision of the genus by Greene (5), followed shortly by one by Costa Lima (2). The former work was based primarily upon material collected by Max Kisiuk and C. E. Cooley on a trip through the West Indies and around South America and specimens collected by James Zetek in Panama. This paper treated 54 species, of which 16 were new. The paper by Costa Lima, based almost entirely on Brazilian material, but including most of the previously described species except those of Greene, contained 62 species, of which 22 species and 1 variety were new. It was this paper that first used extensively and effectively the ovipositor tip as a character, the value of which had previously been pointed out by Dampf (3). Shortly after the appearance of these 2 papers the collection of a number of specimens in the Rio Grande Valley and in Florida that could not be placed in either key made obvious the need for further work on the group. The late F. H. Benjamin was assigned to the task and had recognized a number of new species at the time of his death. The problem was then turned over to the writer, who decided that a revision of the entire genus was called for so that the two recent revisions could be integrated and all the taxonomic information gathered under one cover. During the preparation of this revision a number of new species have been described by Costa Lima and others, and these have been included. In 1939 the writer published two short papers (9 and 10) which removed certain species from the genus. The remainder are dealt with in this paper.

One hundred and four names of species or varieties have been used in combination with *Anastrepha* in the literature. Of these, 13 were erroneously referred to the genus and 17 are believed to be synonyms. The writer has seen the holotypes of 33 of the 104 named forms, a paratype of 1, and cotypes of 10. Of the remainder, specimens have been seen which appear to agree with the original descriptions of 36, and these specimens, in 5 cases, are either of the same rearing or were collected at the same time as those of cotype series. The remaining 24 have not been recognized in any material before the writer, although the original descriptions of many of them are sufficient to permit inclusion of the species in the key. In addition to the 104 old names, 52 new ones are proposed. Including these, and excluding the synonyms and those not properly belonging to the genus, there remain the names of 126 presumably valid species, of which 24 have not been seen by the writer.

The early stages are not described because they are known for relatively few species.

Without doubt many more new species will be found, but the publication of this paper cannot await their discovery. It is hoped that a satisfactory key to the males can be prepared in the future, but the difficulties involved appear insuperable at the present time. There also remains great need for further biological work, since there are so many species for which no food plants are known.

As will be noted under the species involved, wherever possible paratypes of the new species have been deposited in the Instituto Oswaldo Cruz and the British Museum. Also specimens of as many of the old species as are available will be sent to these institutions. This is in acknowledgement of the great assistance rendered by Dr. Costa Lima of the former institution and Dr. Smart of the latter, and because the writer believes that the cause of science is best served by such distribution. The specimens for the British Museum will be set aside until more settled conditions prevail in Europe.

ECONOMIC IMPORTANCE

The damage done by species of *Anastrepha* is caused by the larvae, which feed usually in the fleshy part of the fruit, destroying the flesh and making the fruit unfit for consumption. The eggs are laid in the fruit, and by the time the larvae have reached full size the fruit has dropped and the larvae emerge and go into the soil for pupation.

The menace of these flies to subtropical and tropical fruits is best demonstrated by pointing out that one division of the Bureau of Entomology and Plant Quarantine is engaged in combating them and that another division devotes the major part of its time to studies of the economically important species. The Division of Mexican Fruitfly Control, with headquarters at Harlingen, Tex., carries out control operations against *Anastrepha ludens* and in connection therewith makes observations on the populations of species of *Anastrepha* in the lower Rio Grande Valley. The Division of Fruitfly Investigations, with headquarters in Mexico City, has laboratories in Mexico City, the Panama Canal Zone, Puerto Rico, and Hawaii, and investigates species of *Anastrepha* in the field in northern Mexico and in the Rio Grande Valley in Texas. All its laboratories, with the exception of that in Hawaii, conduct studies on the biology and control of species of *Anastrepha*. These flies are also one of the major problems of the Division of Foreign Plant Quarantines, many infested fruits being intercepted every year.

At present six species of *Anastrepha* are of major economic importance. These are *ludens*, a serious pest of citrus in Mexico and the lower Rio Grande Valley, and also an important pest of the mango; *fraterculus*, attacking many fruits, including citrus, guava, mango, and peach, from Mexico to Argentina; *mombinpraeoptans*, principally attacking mombins or jobos, but also occurring in a number of other fruits such as the mango, rose-apple, and guava; *suspensa*, a West Indian species, principally in tropical almond, guava, and rose-apple, but also found in citrus; *serpentina*, primarily in the sapotaceous fruits and the mamey, but also attacking citrus; and *striata*, with

guava as its principal host. Inga pods, which are of some commercial importance, are attacked by *distincta*, and the melons serve as food plants for *grandis*, although the latter species does not seem to occur in sufficient numbers to be serious. A number of other tropical fruits are attacked by other species, and several species occur in the seed heads of the cassava, or manioc, but they do not appear to cause a serious economic loss. Many of these species are potential pests wherever cultivation is intensive and the right conditions for building up a population prevail.

FOOD-PLANT LIST

The following list (table 1) records only field or market infestations and does not include the many experimental rearings made by the Division of Fruitfly Investigations and other workers. A number of these experimentally successful food plants are mentioned under the species involved. Those species that will tolerate a wide range of food plants in the laboratory are the economically important ones or those that are potentially dangerous, although a number of the fruits that are attacked in the laboratory probably would not be attacked in the field because of inhibiting ecological factors. Food plants are known for only 44 of the species dealt with in this paper.

There seems to be considerable confusion in the proper application of the specific names *mombin*, *lutea*, and *purpurea* in the genus *Spondias*; so it is not possible to be sure of the records for these species. It is probable, however, that a species attacking any one of them would attack the others as well.

At the end of table 1 are given a number of Brazilian vernacular names of plants for which the proper scientific names are unknown.

TABLE 1.—List of food plants of the genus *Anastrepha*

Food plant	Family	Common name	Species of <i>Anastrepha</i>
<i>Achras zapota</i> L.	Sapotaceae	sapodilla	<i>fraterculus</i> , <i>nigrifascia</i> , <i>serpentina</i> .
<i>Anacardium occidentale</i> L.	Anacardiaceae	cashew	<i>mombinpraeoptans</i> .
<i>Ancistrothyrsus lessmanni</i> Harms	Flacourtiaceae		<i>duckei</i> .
<i>Annona cherimola</i> Mill.	Annonaceae	cherimoya	<i>fraterculus</i> , <i>ludens</i> .
<i>Annona hayesti</i> Safford	Annonaceae		<i>mombinpraeoptans</i> .
<i>Annona reticulata</i> L.	Annonaceae	custard apple	<i>ludens</i> , <i>suspensa</i> .
<i>Averrhoa carambola</i> L.	Oxalidaceae	carambola	<i>mombinpraeoptans</i> .
<i>Calocarpum mammosum</i> (L.) Pierre.	Sapotaceae	mamey de tierra, zapote.	<i>mombinpraeoptans</i> , <i>serpentina</i> .
<i>Calyptranthes tonduzii</i> Donn. Smith.	Myrtaceae		<i>striata</i> .
<i>Casimiroa edulis</i> Llave and Lex.	Rutaceae	white sapote	<i>ludens</i> .
<i>Casimiroa tetrameria</i> Millsp.	Rutaceae		<i>ludens</i> .
<i>Chrysobalanus icaco</i> L.	Rosaceae	cocoa-plum	<i>suspensa</i> .
<i>Chrysophyllum cainito</i> L.	Sapotaceae	star-apple	<i>distincta</i> , <i>leptozonea</i> , <i>panamensis</i> , <i>serpentina</i> , <i>suspensa</i> .
<i>Chrysophyllum panamense</i> Pit- tier.	Sapotaceae	small star-apple	<i>panamensis</i> , <i>serpentina</i> , <i>zeteki</i> .
<i>Citrullus vulgaris</i> Schrad.	Cucurbitaceae	watermelon	<i>grandis</i> .
<i>Citrus aurantifolia</i> (Christm.) Swingle.	Rutaceae	lime	<i>ludens</i> .
<i>Citrus aurantium</i> L.	Rutaceae	sour orange	<i>mombinpraeoptans</i> , <i>suspensa</i> .
<i>Citrus grandis</i> (L.) Osbeck	Rutaceae	grapefruit	<i>fraterculus</i> , <i>ludens</i> , <i>mombinprae-</i> <i>optans</i> , <i>suspensa</i> .
<i>Citrus limonia</i> Osbeck	Rutaceae	lemon	<i>ludens</i> .
<i>Citrus sinensis</i> (L.) Osbeck	Rutaceae	sweet orange	<i>fraterculus</i> , <i>ludens</i> , <i>serpentina</i> , <i>sus-</i> <i>pensa</i> .
<i>Coffea arabica</i> L.	Rubiaceae	coffee	<i>fraterculus</i> .
<i>Cucumis sativus</i> L.	Cucurbitaceae	cucumber	<i>grandis</i> .
<i>Cucurbita pepo</i> L.	Cucurbitaceae	pumpkin	<i>grandis</i> .
<i>Cydonia oblonga</i> Mill.	Rosaceae	quince	<i>fraterculus</i> , <i>ludens</i> , <i>serpentina</i> .

TABLE 1.—List of food plants of the genus *Anastrepha*—Continued

Food plant	Family	Common name	Species of <i>Anastrepha</i>
<i>Doryalis hebecarpa</i> Warb.	Flacourtiaceae		<i>fraterculus</i> , <i>mombinpraeoptans</i> , <i>serpentina</i> , <i>fraterculus</i> .
<i>Eriobotrya japonica</i> (Thunb.) Lindl.	Rosaceae	loquat	<i>fraterculus</i> .
<i>Eugenia brasiliensis</i> Lam.	Myrtaceae		<i>fraterculus</i> .
<i>Eugenia jambos</i> L.	Myrtaceae	rose-apple	<i>fraterculus</i> , <i>mombinpraeoptans</i> , <i>suspensa</i> .
<i>Eugenia malaccensis</i> L.	Myrtaceae	malay-apple	<i>fraterculus</i> , <i>mombinpraeoptans</i> , <i>suspensa</i> .
<i>Eugenia nesiotica</i> Standley	Myrtaceae		<i>distincta</i> , <i>mombinpraeoptans</i> .
<i>Eugenia uniflora</i> L.	Myrtaceae	Surinam cherry	<i>fraterculus</i> .
<i>Fortunella margarita</i> (Lour.) Swingle.	Rutaceae	oval kumquat	<i>suspensa</i> .
<i>Genipa americana</i> L.	Rubiaceae		<i>antunesi</i> , <i>bahiensis</i> , <i>phaeoptera</i> .
<i>Helicostylis voeppigiana</i> Tréc.	Moraceae		<i>distincta</i> .
<i>Inga edulis</i> Mart.	Leguminosae		<i>distincta</i> .
<i>Inga feuillei</i> DC.	Leguminosae		<i>distincta</i> .
<i>Inga goldmanii</i> Pittier	Leguminosae		<i>distincta</i> .
<i>Inga hayesii</i> Benth.	Leguminosae		<i>distincta</i> .
<i>Inga inicuili</i> Cham. and Schlect	Leguminosae		<i>ludens</i> .
<i>Inga lushanathiana</i> Benth.	Leguminosae		<i>distincta</i> .
<i>Inga panamensis</i> Seem	Leguminosae		<i>distincta</i> .
<i>Inga punctata</i> Willd.	Leguminosae		<i>distincta</i> .
<i>Inga spuria</i> Humb. and Bonpl.	Leguminosae		<i>distincta</i> .
<i>Inga setifera</i> DC.	Leguminosae		<i>distincta</i> .
<i>Lucuma caimito</i> R. and S.	Sapotaceae	abiu	<i>leptoazona</i> .
<i>Lucuma</i> sp.	Sapotaceae		<i>bondari</i> , <i>parallela</i> .
<i>Lucuma</i> sp.	Sapotaceae	<i>bicumucha</i>	<i>leptoazona</i> .
<i>Lucuma</i> sp.?	Sapotaceae	socavita	<i>aphelocentema</i> .
<i>Mammea americana</i> L.	Guttiferae	mamey	<i>ludens</i> , <i>serpentina</i> .
<i>Mangifera indica</i> L.	Anacardiaceae	mango	<i>distincta</i> , <i>fraterculus</i> , <i>ludens</i> , <i>mombinpraeoptans</i> , <i>serpentina</i> , <i>striata</i> .
<i>Manihot dulcis</i> (Gmel.) Pax	Euphorbiaceae	sweet cassava	<i>manihoti</i> , <i>montei</i> , <i>pickeli</i> .
<i>Manihot esculenta</i> Crantz	Euphorbiaceae	bitter cassava	<i>montei</i> , <i>pickeli</i> , <i>striata</i> .
<i>Mimusops coriacea</i> Miq.	Sapotaceae		<i>serpentina</i> .
<i>Mimusops emarginata</i> Britt	Sapotaceae		<i>nigrifascia</i> .
<i>Myrciaria</i> sp.	Myrtaceae	jaboticabeira da mata	<i>distincta</i> var. <i>minensis</i> .
Myrtaceous fruit.	Myrtaceae		<i>alveata</i> .
<i>Passiflora ambigua</i> Hemsf.	Passifloraceae		<i>pallidipennis</i> .
<i>Passiflora edulis</i> Sims	Passifloraceae	purple water lemon.	<i>consobrina</i> .
<i>Passiflora laurifolia</i> L.	Passifloraceae	yellow water lemon.	<i>ethalea</i> .
<i>Passiflora quadrangularis</i> L.	Passifloraceae	granadilla	<i>consobrina</i> , <i>ethalea</i> , <i>limae</i> , <i>pallidipennis</i> , <i>pseudoparallela</i> .
<i>Passiflora seemanni</i> Griseb.	Passifloraceae		<i>pallidipennis</i> .
<i>Passiflora vitifolia</i> H. B. K.	Passifloraceae		<i>passiflorae</i> .
<i>Passiflora</i> sp.	Passifloraceae		<i>lutzi</i> .
<i>Prunus amygdalus</i> Batsch	Rosaceae	almond	<i>mombinpraeoptans</i> .
<i>Prunus persica</i> (L.) Batsch	Rosaceae	peach	<i>fraterculus</i> , <i>ludens</i> .
<i>Psidium cattleianum</i> Sabine	Myrtaceae	strawberry guava.	<i>suspensa</i> .
<i>Psidium guajara</i> L.	Myrtaceae	guava	<i>bistrigata</i> , <i>fraterculus</i> , <i>lathana</i> , <i>mombinpraeoptans</i> , <i>pseudoparallela</i> ?, <i>punctata</i> , <i>striata</i> , <i>suspensa</i> .
<i>Psidium guineense</i> Sw.	Myrtaceae		<i>bistrigata</i> .
<i>Psidium</i> sp.	Myrtaceae		<i>ornata</i> ?
<i>Punica granatum</i> L.	Punicaceae	pomegranate	<i>ludens</i> .
<i>Pyrus communis</i> L.	Rosaceae	pear	<i>fraterculus</i> , <i>ornata</i> .
<i>Quararibea asterolepis</i> Pittier	Bombaceae	guayabille	<i>crebra</i> .
<i>Quararibea "penduliflora"</i>	Bombaceae		<i>greenel</i> , <i>quararibaeae</i> .
<i>Quararibea turbinata</i> Poir.	Bombaceae		<i>greenel</i> , <i>pickeli</i> , <i>quararibaeae</i> .
<i>Quilina glaziovii</i> Engl.	Quilinaeae		<i>quilinae</i> .
<i>Rhedea madruno</i> (H. B. K.) Planch. and Tr.	Guttiferae	madruno	<i>rheediae</i> .
<i>Sargentia greonii</i> Coult.	Rutaceae		<i>ludens</i> .
<i>Spondias dulcis</i> Parkinson	Anacardiaceae	otaheite-apple	<i>mombinpraeoptans</i> .
<i>Spondias mombin</i> L.	Anacardiaceae	spanish plum	<i>antunesi</i> , <i>fraterculus</i> , <i>mombinpraeoptans</i> , <i>serpentina</i> , <i>suspensa</i> .
<i>Spondias nigrescens</i> Pittier	Anacardiaceae		<i>fraterculus</i> , <i>mombinpraeoptans</i> .
<i>Spondias purpurea</i> L.	Anacardiaceae		<i>antunesi</i> , <i>fraterculus</i> , <i>mombinpraeoptans</i> .
<i>Spondias</i> sp.	Anacardiaceae		<i>striata</i> .
<i>Sterculia</i> sp.	Sterculiaceae		<i>parallela</i> .
<i>Terminalia catappa</i> L.	Combretaceae	tropical almond	<i>suspensa</i> .
<i>Tetrastylis oralis</i> Vell.	Passifloraceae		<i>kuhlmanni</i> .
<i>Turpinia paniculata</i> Vent.	Staphylaceae		<i>canalis</i> , <i>fraterculus</i> , <i>turpiniae</i> .
<i>Vitis vinifera</i> L.	Vitaceae	grape	<i>fraterculus</i> .
<i>Ximenia americana</i> L.	Oleaceae	hog plum	<i>fraterculus</i> .
<i>Zschokkea panamensis</i> Woodson	Apocynaceae		<i>anomala</i> , <i>serpentina</i> .

TABLE 1.—List of food plants of the genus *Anastrepha*—Continued

Food plant	Family	Common name	Species of <i>Anastrepha</i>
<i>Zuelania guidonia</i> (Swartz) Britt. and Millsp.	Flacourtiaceae	-----	<i>zuelaniae</i> .
-----	-----	alandy	<i>bondari</i> .
-----	-----	amora de leite	<i>bondari</i> .
-----	-----	guapeba branca	<i>benjamini</i> .
-----	-----	guarobeira	<i>bahiensis, bondari</i> .
-----	-----	mapeba branca	<i>leptozona</i> .
-----	Sapotaceae	mucuri branco	<i>submunda</i> .
-----	-----	pau macaco	<i>leptozona</i> .
-----	Annonaceae	pinha vermelha de leite.	<i>submunda</i> .

GEOGRAPHICAL DISTRIBUTION

So far as is known, the genus is confined to that portion of the Western Hemisphere lying between latitudes 27° N. and 35° S., but attains its greatest development within the tropics. The large number of species discovered in a small portion of Panama is indicative of the size of the genus, and collecting in other regions as intensive as has been done in Panama will certainly disclose many more new species.

An analysis of the distributional data that we now have indicates a large South American fauna extending into the tropical portions of Central America, a few Mexican species, and a West Indian fauna extending into southern Florida. Of the 12 species known from Mexico, 8 are found also in Panama, and the distribution of 3 of the remaining 4, viz, *aphelocentema*, *lathana*, and *tripunctata*, is really unknown since they are each known to the writer from a single collection only. This leaves *ludens* as the only species that can with assurance be said to be strictly northern in distribution, its occurrence south of Mexico being only at the higher altitudes. Of the 9 species from the Florida-Antillean region (exclusive of Trinidad and Tobago) only 2, *dissimilis* and *mombinpraeoptans*, are known from outside the area. Two others, *interrupta* and *nigrifascia*, are known only from Florida, but the latter, at least, will with little doubt be found in the Greater Antilles, and 1 other, *obliqua*, is unrecognized. Of the 61 species from Brazil and Argentina combined, 29 are known only from south of the Amazon River basin. A number of the species from Bahia, however, will probably be found to occur farther north.

While certain species are probably very restricted in their distribution, a few are widespread. Most notable of the latter are *fraterculus*, found from Texas to Argentina; *serpentina*, found from Texas to Sao Paulo, Brazil; and *mombinpraeoptans*, occurring throughout the northern portion of the range of the genus with another center of population near Rio de Janeiro.

The list which follows gives the species known to occur in various geographical portions of the range of the genus.

Distribution of the species of Anastrepha, by countries

ARGENTINA (9):

alveata, *barbiellinii*, *elegans*, *fraterculus*, *grandis*, *haywardi*, *kuhlmanni*, *lutzi*, *punctata*.

BOLIVIA (5):

conjuncta, *grandis*, *leptozona*, *nigripalpus*, *striata*.

BRAZIL (59):

amnis, antunesi, atrigona, bahiensis, barbiellinii, barnesi, benjamini, bezzii, binodosa, bistrigata, bondari, borgmeieri, caudata, concava, connexa, consobrina, costalimai, cruzi, curitis, discessa, dissimilis, distincta, distincta var. *minensis, duckei, elegans, ethalea, extensa, fenestrata, fischeri, flavipennis, fraterculus, fumipennis, furcata, grandis, greenei, hastata, hendeliana, integra, kuhlmanni, leptozona, lutzi, manihoti, mombinpraeoptans, montei, parallela, perdita, phacoptera, pickeli, pseudoparallela, punctata, quararibeeae, quinae, robusta, serpentina, sodalis, striata, submunda, townsendi, xanthochaeta.*

BRITISH GUIANA (7):

barnesi, convoluta, dissimilis, distincta, fractura, leptozona, striata.

BRITISH HONDURAS (3):

cordata, fraterculus, serpentina.

CHILE (1):

fraterculus.

COLOMBIA (5):

distincta, fraterculus, grandis, pallidipennis, striata.

COSTA RICA (8):

distincta, fraterculus, ludens, mombinpraeoptans, montei, schausi, serpentina, striata.

CUBA AND ISLE OF PINES (5):

insulae, mombinpraeoptans, obliqua, ocesia, suspensa.

ECUADOR (6):

distincta, fraterculus, mombinpraeoptans, ornata, serpentina, striata.

GUATEMALA (7):

barnesi, distincta, leptozona, ludens, mombinpraeoptans, robusta, serpentina.

HISPANIOLA (4):

dissimilis, mombinpraeoptans, ocesia, suspensa.

HONDURAS (5):

crebra, leptozona, mombinpraeoptans, serpentina, striata.

JAMAICA (3):

mombinpraeoptans, ocesia, suspensa.

LESSER ANTILLES (1):

mombinpraeoptans.

MEXICO (13):

aphelocentema, chichilayae, distincta, fraterculus, lathana, ludens, mombinpraeoptans, robusta, serpentina, spatulata, striata, tripunctata, zuelaniae.

PANAMA (54):

acris, alveata, anomala, antunesi, bahiensis, balloui, barnesi, buscki, canalis, chichilayae, compressa, concava, cordata, crebra, debilis, distincta, flavipennis, fraterculus, furcata, galbina, grandis, iretita, lanceola, leptozona, limae, loewi, lutea, macra, manihoti, minuta, mombinpraeoptans, montei, mucronota, palae, pallidipennis, panamensis, passiflorae, pickeli, pulchra, ramosa, rheediae, robusta, scobinae, serpentina, similis, spatulata, speciosa, striata, superflua, teretis, tumida, turpiniae, zetekii, zuelaniae.

PARAGUAY (5):

elegans, fraterculus, grandis, montei, punctata.

PERU (11):

chichilayae, cryptostrepha, distans, distincta, fraterculus, inca, lambda, nigripalpus, serpentina, shannoni, striata.

PUERTO RICO (3):

edentata, mombinpraeoptans, suspensa.

SURINAM (3):

atrigona, serpentina, striata.

TRINIDAD AND TOBAGO (11):

antunesi, convoluta, distincta, ethalea, fraterculus, leptozona, mombinpraeoptans, rheediace, serpentina, striata, sylvicola.

UNITED STATES (15):

Florida (6):

edentata, interrupta, mombinpraeoptans, nigrifascia, ocesia, suspensa.

Texas (10):

chichilayae, distincta, fraterculus, limac, ludens, mombinpraeoptans, serpentina, spatulata, striata, zuelaniae.

URUGUAY (1):

fraterculus.

VENEZUELA (10):

alveata, *balloui*, *canalis*, *fraterculus*, *loewi*, *mombinpracoctans*, *munda*,
pickeli, *serpentina*, *striata*.

— ? (3):

bivittata, *tubifera*, *undosa*.

THE SPECIFIC CHARACTERS AND THEIR TERMINOLOGY

The descriptions in this publication are rather brief, for two reasons. In the first place, certain features that are nearly the same throughout the genus, deviating in only a few species, have not been described for all the species, but only for those in which there is a departure from the usual condition. Secondly, when the wing pattern and the ovipositor tip are described, only the more important features are mentioned; a general idea of the pattern or structure is given, but it is left to the figures to show the finer details. The following paragraphs explain the characters that are used, describe the usual condition when this is not found throughout the genus, and give the terminology employed.

Head.—The head is described only when there is a departure from its usually uniform yellowish color or from its structure. The frontoclypeus is usually straight or slightly concave in profile, but in one small group it is decidedly convex. Except where specifically mentioned, the normal number of upper fronto-orbital bristles is two. In one species (*schausi*) the oral margin is greatly expanded and blackened; in all others it is very narrow and not darkened.

Thorax.—The thoracic pattern is given in every case although this results in a considerable amount of repetition. There seems to be a sufficient number of species in which the basic pattern is modified to warrant this. The chaetotaxy of the mesonotum appears to be of little significance, although the relative position of the dorsocentral and acrostichal bristles might be of some value. The sternopleural bristle is described when present, or its absence is noted.

Wings.—Except where noted, the veins of the radial sector run a fairly even course with no undulations, although vein R_{4+5} bends downward somewhat beyond cross vein $r-m$. Except where noted, vein M_{1+2} turns upward near the apex, but does not reach the apex of the **S** band. In a few species this vein is scarcely turned forward; in some others it turns forward more than usual. The basic wing pattern consists of three infuscated areas called here the costal band, the **S** band, and the **V** band. The costal band runs from the wing base to the apex of vein R_1 and fills the bases of all the radial cells. The **S** band runs from the basal half of cell Cu_1 obliquely forward across the wing to about the apical third of the fore margin and then along the margin to the apex. The **V** band is inverted, consisting of an arm from the hind margin of the wing along cross vein m and forward to vein R_{4+5} and another arm from the hind margin a short distance proximad of the apex of vein M_{1+2} forward to meet the other arm at vein R_{4+5} . This pattern is subject to considerable modification. The costal and **S** bands occasionally fill in all of cell R_1 , or they may be entirely disconnected. The **V** band may be incomplete, the whole distal arm sometimes being lost. The **V** band may or may not be joined to the **S** band. These modifica-

tions are all described or figured, and the wing pattern provides a valuable, although not invariable, set of characters.

Legs.—With few exceptions no distinguishing characters have been discovered on the legs, and these are usually not mentioned in the descriptions.

Abdomen.—Except where otherwise indicated, the abdomen is colorous. The ovipositor sheath, rasper, and ovipositor are described for the female, and the apical portion of the ovipositor is figured wherever possible, showing the outline of the sensoria as they appear in a ventral view by transmitted light. The length of the ovipositor sheath as given is from the extreme base at the level of the black lateral flaps to the apex, and does not include the membranous portion bearing the rasper, although this is frequently extruded. The term "rasper" is here applied to the group of hooks on the membrane at the apex of the ovipositor. In describing the rasper only the well developed hooks are mentioned, but it is frequently difficult to determine where the hooks end and the scalelike plates begin, basally. The hooks are so placed that in counting the rows it is necessary to proceed obliquely across the mass. The measurement of the ovipositor tip is taken from the extreme apex of the oviduct to the apex of the ovipositor. Sometimes modified portions of the ovipositor tip extend basad of the end of the oviduct. The *tergal ratio* given for the male is the length of the fifth tergite divided by the combined lengths of the third and fourth tergites. Since considerable variation occurs within a species, this figure is not of great significance. Wherever possible, it represents an average of a number of specimens.

METHODS

Since the female terminalia are of great taxonomic value, their proper preparation for study is important. If the material is received in liquid, as was most of that used in this study, it is frequently possible to expose the tip of the ovipositor without removing the ovipositor sheath from the body. This is done by placing the fly on its back in liquid under a binocular stereoscopic microscope, holding the ovipositor sheath with forceps, inserting a needle into the basal foramen of the sheath, and pushing against the base of the ovipositor. For making slide mounts the ovipositor sheath should be removed and macerated in potassium hydroxide, then transferred to water, and the ovipositor pushed out part way. Then the ovipositor should be seized and pulled out carefully, followed by the membrane. Great care must be taken in pulling out the basal portion of the membrane, bearing the rasper, but with practice this usually can be done satisfactorily. The structures can then be prepared for mounting in the usual manner, and it is advisable to mount the sheath and rasper with dorsal surface up, under one cover glass, and the ovipositor, with ventral surface up, under another.

For studying the internal genitalia of the male, staining is necessary, and the writer has found a mercurochrome stain to be satisfactory. Since the claspers and other external structures are decidedly three-dimensional, it is difficult to get a satisfactory mount of them under a cover glass. Usually the shape of the claspers can be studied as well *in situ* by means of a high power of the binocular microscope.

THE ILLUSTRATIONS

The line drawings of the ovipositor tips were made by the writer, a micrometer disk ruled in squares and coordinate paper being used. A 6× ocular and 4-millimeter objective were used in making the drawings, and the figures as reproduced here represent a magnification of about 146.5 diameters except where indicated otherwise. The outline of the tip, the position of the sensoria, and the outline of the end of the oviduct are shown as accurately as possible; but the flaps at the apex of the oviduct have been omitted in most of the drawings, and it is not evident from the drawings, or easy to determine from the specimens, which sensoria open dorsally and which ventrally. The proportions of the ovipositor tip, the character of the lateral armature, and the general appearance of the sensoria are of diagnostic value, while the position of individual sensoria and the actual number of serrations are subject to variation. The two drawings of the rasps were made by Mrs. Mary Foley Benson, of the Bureau of Entomology and Plant Quarantine, and represent an enlargement of about 58 diameters. The photographs of the wings represent an enlargement of 10 diameters except for those of *Anastrepha tripunctata* and *A. tubifera*. These were both photographed by John Smart, of the British Museum, the first being of the female cotype at a magnification of 17 diameters, the second of the holotype at a magnification of 8.6 diameters. The ovipositor tip of *tubifera* is magnified about 180 diameters.

SPECIES INCORRECTLY PLACED IN THE GENUS

The following species belong to the genus *Lucumaphila* Stone and were discussed by the writer in an earlier paper (9): *Anastrepha acidusa* (Walker), *A. hamata* (Loew), *A. hambletoni* Costa Lima, *A. longicauda* Costa Lima, *A. luederwaldti* Costa Lima, *A. obscura* Aldrich, *A. urichi* Greene, and *A. zernyi* Costa Lima.

The following species belong to the genus *Pseudodacus* Hendel and were discussed by the writer in a second paper (10): *Anastrepha daciformis* Bezzi, *A. macrura* Hendel, and *A. pallens* Coquillett.

Anastrepha extranea de Meijere (Tijdschr. v. Ent. 57 : 193, pl. 5, fig. 7, 1914; *ibid.* 60 : 329, 1918) has not been seen by the writer, but it is rather certainly not an *Anastrepha*. There is nothing in the original description definitely to exclude it from the genus, but the later statement that the ovipositor is flattened rather than rounded and the fact that the species comes from Java make its exclusion rather conclusive. Hendel (*in* Lindner, Erwin, Die Fliegen der palaearktischen Region, v. 5 (49. Trypetidae) : 105, 1927), in a discussion of his genus *Anastrephoides*, writes, "Ob die javanische *Anastrepha extranea* de Meijere * * * auch zu *Anastrephoides* gehört, weiss ich nicht; eine *Anastrepha*-Art ist sie sicher nicht." Its correct generic position must await study of the original material.

Anastrepha fuscobasalis Hering (Stettin. Ent. Ztg. 96 : 226, fig. 1, 1935), a paratype of which was kindly sent the writer by Dr. Hering, proves to belong to some genus other than *Anastrepha*, the head shape, thoracic pattern, wing pattern, and male claspers being quite different from those of any known species of *Anastrepha*. Its correct generic

position is uncertain, and it is probable that a new genus must be erected for it. The specimen has been returned to Dr. Hering with the suggestion that this be done.

The Genus ANASTREPHA Schiner

- Anastrepha* Schiner, Reise der Novara, Diptera, p. 263, 1868; Coquillett, N. Y. Ent. Soc. Jour. 7: 259, 1899; Aldrich, Smithsn. Inst. Misc. Collect. 46 (1444): 601, 1905; Bezzi, Portici R. Scuola Super. di Agr. Lab. Zool. Gen. e Agr. Bol. 3: 280, figs. 2, 3, 1909; Hendel, [Dresden] K. Zool. u. Anthropol. Ethnog. Mus. Abhandl. u. Ber. 14 (3): 5 and 13, 1914; Greene, Wash. Ent. Soc. Proc. 36: 130, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 490, 1934. (Genotype, *Dacus serpentinus* Wiedemann, by original designation.)
- Acrotaxa* Loew, Smithsn. Inst. Misc. Collect. 11 (256): 227, 1873. (Genotype, *Dacus fraterculus* Wiedemann, by designation of Bezzi 1909.)
- Trypeta* (*Acrotaxa*) Loew: Osten Sacken, Smithsn. Inst. Misc. Collect. 16 (270): 189, 1878.

Generic characters.—Head slightly wider than high and distinctly higher than long; frons about one-third width of head; clypeus depressed below antennae, leaving a rather broad median ridge, which is usually straight or slightly concave in profile, but occasionally distinctly convex. Antenna rather short, not attaining oral margin; arista finely pilose. Palpus flattened, rather broad, the ventral margin convex. Proboscis short and fleshy. Lower fronto-orbital bristles three to five, variable; upper fronto-orbitals usually two, but variable within species; inner vertical and outer vertical bristles usually one each.

Macrochaetae of thorax: One acrostichal close to scutellum; one dorsocentral slightly anterior to acrostichal; one sublateral at anterior margin close to humerus; one intra-alar about in transverse line with acrostichal; one humeral; one presutural; two supra-alars; two notopleurals; two marginal scutellars, one near apex, one near base; one mesopleural, one pteropleural; a posterior sternopleural may or may not be present, but it is rarely as strong as the pteropleural. A black spot on thorax behind wing and under squama.

Wing: Apex of vein R_1 slightly distad of middle of wing; vein M_{1+2} usually distinctly curved forward at apex; hind margin of anal cell, from axillary excision to apex, slightly longer than petiole of anal cell; vein R_1 , and vein R_{4+5} to near cross vein $r-m$, setulose.

Legs: Fore femora with long, slender macrochaetae ventrally; fore and middle tibiae each with one or more spurs.

Abdomen: Five unmodified tergites, the first and second somewhat coalescent. Ovipositor sheath a subcylindrical, tapering tube, at least twice as long as width at base, with a single pair of spiracles basad of middle; base of sheath with a laterally projecting flap on each side, bearing a pronounced black spot. Within sheath a heavily sclerotized, usually somewhat flattened ovipositor with opening of oviduct ventral and near apex. A group of rather strong hooks, the rasper, on dorsal surface of membrane connecting ovipositor with ovipositor sheath, near apex of sheath, the hooks curving anteriorly when extruded. Male terminalia rather small, consisting of a pair of ventrally directed claspers, each bearing two stout teeth on its inner, posterior surface, and a slender aedeagus, somewhat enlarged apically, approximately as long as ovipositor, and coiled under fifth tergite.

The generic name *Leptoxyda* Macquart, later emended by Macquart to *Leptoxys*, has been associated with this genus because in Macquart's later paper he placed *Dacus serpentinus* in his genus. *Leptoxyda* is monobasic, however, having been proposed for a single species, *tessacea* Macquart, from Senegal, and appears to be quite different from *Anastrepha*.

KEY TO SPECIES³

1. No distinct hyaline spot in cell R₁ beyond apex of vein R₁, although there may be a subhyaline streak not touching either costa or vein R₂₊₃; distal arm of V band absent----- 2
 A distinct hyaline spot in cell R₁ beyond apex of vein R₁, either broadly bordering costa or crossing vein R₂₊₃, or both; if this spot obliterated, V band complete, with proximal arm greatly widened and darkened----- 6
2. (1) Vein R₂₊₃ somewhat undulant; metanotum yellow----- 3
 Vein R₂₊₃ not undulant; metanotum marked extensively with black----- 4
3. (2) Ovipositor sheath more than 11 mm. long
bezzii Costa Lima (p. 20).
 Ovipositor sheath less than 8 mm. long
balloui, new species (p. 20).
4. (2) Cell M hyaline; mesoscutum with black stripes; proximal arm of V band usually not crossing cell R----- 5
 Cell M infuscated; mesoscutum not striped with black; proximal arm of V band joined to S band at vein R₁₊₅
atrigena Hendel (p. 21).
5. (4) Cell R completely infuscated; mesoscutum and pleura largely black----- *shannoni*, new species (p. 23).
 Cell R largely hyaline medially; mesoscutum and pleura with little black----- *grandis* (Macquart) (p. 22).
6. (1) Wing pattern predominantly dark brown; distal arm of V band reduced or absent, not joining proximal arm at anterior end of latter; metanotum predominantly dark brownish black----- 7
 Not with this combination of characters----- 11
7. (6) Distal arm of V band present, separated from proximal arm, or narrowly joined to side of latter at vein M₁₊₂
ocresia (Walker) (p. 24).
- Distal arm of V band absent----- 8
8. (7) Costal and S bands completely separated----- *ornata* Aldrich (p. 25).
 Costal and S bands connected----- 9
9. (8) Costal and S bands broadly coalescent to form a large dark brown spot in disk of wing completely filling cell R and cell first M₂----- *pulchra*, new species (p. 26).
 Costal and S bands not so broadly coalescent as completely to fill cell R and cell first M₂----- 10
10. (9) Thoracic pleura largely dark brown; dark color on sides of tergites 2-4 contiguous and usually extensive; ovipositor less than 3.8 mm. long----- *serpentina* (Wiedemann) (p. 27).
 Brown on pleura usually confined to a small spot below wing base; dark color on tergites 2-4 forming narrow bands, not contiguous; ovipositor more than 3.8 mm. long
anomala, new species (p. 29).
11. (6) Mesoscutum, when viewed from in front, patterned with hoary pile and dark-brown to black pile; ovipositor tip at least 0.19 mm. wide----- 12
 Mesoscutum not with hoary pile; ovipositor tip rarely this wide----- 13
12. (11) Dark areas of mesoscutum with dense patches of stout, black pile; lateral half of brown stripe from transverse suture to scutellum denuded; ovipositor less than 3 mm. long
striata Schiner (p. 20).
 Dark areas of mesoscutum with dark-brown pile, not so stout and not in so dense, discrete patches; dark stripe from transverse suture to scutellum with setae on lateral half; ovipositor more than 3 mm. long----- *bistrigata* Bezzi (p. 31).

³ This key is designed for females only, except in those species, placed early in the key, which may be recognized by certain tinctorial or structural characters found in both sexes. Satisfactory characters that can be used in a key have not yet been discovered for most of the males.

Certain species have not been included in the key, either because of inability of the author to feel certain of their identity or because only the male is known. These species should be considered whenever a female is discovered that cannot be recognized from the key or descriptions. They are as follows: *bivittata*, *borgmeieri*, *conjuncta*, *conneza*, *cruci*, *distans*, *fenestrata*, *furcata*, *hendeliana*, *integra*, *lambda*, *minensis*, *munda*, *obliqua*, and *phaeoptera*.

13. (11) Proximal arm of V band unusually broad, dark brown, rest of wing pattern normal yellowish-----*cordata* Aldrich (p. 35).
Wing pattern otherwise----- 14
14. (13) Clypeal ridge distinctly swollen so that in profile it is decidedly convex (cf. *hastata*, couplet 53)----- 15
Clypeal ridge straight or concave in profile----- 19
15. (14) Ovipositor sheath slender, rather abruptly widened basally, the spiracles not more than 1.3 mm. from base----- 16
Ovipositor sheath not so slender, not abruptly widened basally, the spiracles more than 1.8 mm. from base----- 17
16. (15) Spiracles of ovipositor sheath about 0.45 mm. from base
pallidipennis Greene (p. 32).
Spiracles of ovipositor sheath 1.2 mm. from base
curitis, new species (p. 32).
17. (15) V band separated from S band; serrations of ovipositor tip extending more than half distance from apex to end of oviduct; width of tip at level of proximal serration not much narrower than width at apex of oviduct
superflua, new species (p. 33).
V band joined to S band; serrations of ovipositor tip extending less than half distance from apex to end of oviduct; width of tip at level of proximal serration much less than width at apex of oviduct----- 18
18. (17) Costal and S bands separated; ovipositor slender and the tip rather long, with serrate portion occupying apical third; a rather distinct angle at junction of shaft with the tapering portion somewhat distad of apex of oviduct; sensoria rather long, the central core narrow
discessa, new species (p. 34).
Costal and S bands narrowly connected; ovipositor stouter, the tip shorter, with serrate portion occupying apical two-fifths; shaft merging with narrowed tip by a broad curve; sensoria shorter, the central core broader
benjamini Costa Lima (p. 34).
19. (14) Hyaline area between costal and S bands crossing vein R_{4+5} although it may be broken anterior to this----- 20
Costal and S bands touching to broadly confluent on vein R_{4+5} ----- 56
20. (19) Two distinct black spots on hind margin of mesoscutum
punctata Hendel (p. 36).
Not more than one black spot on hind margin of mesoscutum, if any----- 21
21. (20) Oral margin expanded, with a shiny black band
schausi Aldrich (p. 37).
Oral margin narrow, concolorous with rest of head----- 22
22. (21) A black spot at apex of scutellum; a distinct hyaline spot at apex of vein R_{2+3} and a smaller one at apex of vein R_{4+5}
tripunctata Van der Wulp (p. 38).
Without these characters----- 23
23. (22) Ovipositor much longer than ovipositor sheath and coiled within the somewhat swollen base of sheath
convoluta, new species (p. 38).
Ovipositor not longer than sheath, nearly or quite straight----- 24
24. (23) Tip of ovipositor serrate----- 25
Tip of ovipositor not serrate (cf. *lancoleta*, couplet 38)----- 39
25. (24) Less than apical half of ovipositor tip serrate, the tip uniformly tapering to apex, the serrations relatively few, but not prominent; ovipositor at least 3.2 mm. long, usually considerably longer-----*ludens* (Loew), part (p. 97).
Not agreeing entirely with this----- 26
26. (25) Ovipositor not more than 3.5 mm. long----- 27
Ovipositor more than 4.0 mm. long----- 38
27. (26) Ovipositor less than 1.5 mm. long, tapering from base to apex; tip short, with 15 or more teeth
pickeli Costa Lima, part (p. 63).
Ovipositor usually longer than 1.5 mm.; if shorter, the shaft and tip not as in *pickeli*----- 28

28. (27)	Ovipositor less than 2.0 mm. long-----	29
	Ovipositor at least 2.0 mm. long-----	33
29. (28)	V band without distal arm----- <i>haywardi</i> Blanchard (p. 39).	
	Distal arm of V band present-----	30
30. (29)	Ovipositor distinctly wider at end of oviduct than at level of first serrations-----	31
	Ovipositor not wider at end of oviduct than at level of first serrations----- <i>minuta</i> , new species (p. 46).	
31. (30)	V band usually joined to S band anteriorly; usually a median, scutoscuteellar, dark spot (Greater Antilles and Florida) <i>suspensa</i> (Loew), part (p. 74).	
	V band completely separated from S band; no median scutoscuteellar dark spot (South and Central America)-----	32
32. (31)	Ovipositor distinctly constricted just basad of serrate portion <i>fraterculus</i> (Wiedemann), part (p. 78).	
	Ovipositor not constricted basad of serrate portion <i>bahiensis</i> Costa Lima, part (p. 107).	
33. (28)	Length of serrate portion of ovipositor tip more than twice as great as width at base of serrate portion-----	34
	Length of serrate portion less than 1.5 times as great as width at base of serrate portion-----	36
34. (33)	V band slender, usually broken anteriorly, brown in color, the distal arm frequently much reduced; vein M ₁₊₂ extending forward to end of S band----- <i>leptozona</i> Hendel (p. 57).	
	V band broad, complete, and decidedly orange yellow in color; vein M ₁₊₂ not reaching S band-----	35
35. (34)	Ovipositor not less than 2.8 mm. long <i>dissimilis</i> , new species (p. 40).	
	Ovipositor not more than 2.4 mm. long <i>chiclayae</i> Greene, part (p. 41).	
36. (33)	Ovipositor tip with serrations rather coarse and with a distinct constriction basad of serrate portion <i>elegans</i> Blanchard (p. 42).	
	Ovipositor tip with serrations fine and with no distinct constriction basad of serrate portion-----	37
37. (36)	Ovipositor about 2.2 mm. long; serrate portion extending little more than half distance from apex to end of oviduct, the teeth becoming somewhat submarginal basally; macrochaetae yellow orange----- <i>xanthochaeta</i> Hendel (p. 43).	
	Ovipositor more than 2.6 mm. long; serrate portion extending nearly two-thirds distance from apex to end of oviduct, the teeth all marginal; macrochaetae nearly black <i>similis</i> Greene (p. 43).	
38. (26)	Ovipositor tip uniformly tapering to apex <i>consobrina</i> (Loew), part (p. 87).	
	Ovipositor tip slightly swollen just distad of end of oviduct, subparallel to near apex and then abruptly narrowed to apex----- <i>lanceola</i> , new species (p. 44).	
39. (24)	Ovipositor less than 4.5 mm. long-----	40
	Ovipositor more than 4.5 mm. long (except occasionally in <i>parallela</i>)-----	51
40. (39)	Ovipositor not more than 2.0 mm. long-----	41
	Ovipositor not less than 2.4 mm. long-----	43
41. (40)	Macrochaetae of thorax black-----	42
	Macrochaetae of thorax yellow orange <i>quararibae</i> Costa Lima, part (p. 44).	
42. (41)	V band joined to S band anteriorly; ovipositor tip more than three times as long as greatest width <i>crebra</i> , new species, part (p. 45).	
	V band completely separated from S band; ovipositor tip about twice as long as greatest width <i>submunda</i> Costa Lima (p. 47).	
43. (40)	Ovipositor not more than 3 mm. long-----	44
	Ovipositor more than 3 mm. long-----	45

44. (43) Macrochaetae black; wing bands predominantly dark brown; cell R_3 not distinctly narrowed opposite cross vein $r-m$ -----
insulae, new species (p. 47).
 Macrochaetae yellow to yellow brown; wing bands predominantly yellow; cell R_3 distinctly narrowed opposite cross vein $r-m$ -----
debilis, new species (p. 47).
45. (43) Ovipositor slender, the tip at widest about 0.07 mm. wide----- 46
 Ovipositor stouter, the tip not less than 0.1 mm. wide at widest----- 47
46. (45) Wing rarely more than 6 mm. long; hyaline area between costal and S bands usually narrower at costal margin than along vein R_{4+5} , the bands sometimes connected at vein R_{2+3} ; V band usually joined to S band-----
edentata, new species, (p. 48).
 Wing not less than 8 mm. long; hyaline area between costal and S bands not narrowed anteriorly; V band separated from S band-----
tubifera (Walker) (p. 49).
47. (45) Hyaline band between costal and S bands narrowed anteriorly, scarcely reaching costal margin-----
loewi, new species (p. 49).
 Hyaline band broadly in contact with costal margin beyond stigma----- 48
48. (47) Vein R_{2+3} strongly undulant, cell R_3 being constricted at cross vein $r-m$; wing about 10 mm. long; tip of vein M_{1+2} not touching S band-----
undosa, new species (p. 50).
 Vein R_{2+3} not undulant; wing much shorter, or vein M_{1+2} touching apex of S band----- 49
49. (48) Vein M_{1+2} curved forward to apex of S band-----
costalimai Autuori (p. 51).
 Vein M_{1+2} not reaching apex of S band----- 50
50. (49) Ovipositor tip somewhat constricted beyond oviduct-----
aphelocentema, new species (p. 51).
 Ovipositor tip not constricted beyond oviduct-----
greenei Costa Lima (p. 51).
51. (39) Ovipositor more than 8 mm. long-----
barnesi Aldrich (p. 52).
 Ovipositor less than 6 mm. long----- 52
52. (51) Cell R_3 decidedly constricted, the constriction distad of cross vein $r-m$ -----
parallela (Wiedemann) (p. 53).
 Cell R_3 only slightly narrowed, the narrowing opposite cross vein $r-m$, or not narrowed----- 53
53. (52) V band complete, not joined to S band----- 54
 V band broken anteriorly, the proximal arm joined to S band-----
hastata, new species (p. 55).
54. (53) Ovipositor tip at least 0.5 mm. long; rasper of very many large hooks gradually diminishing in size basally; apex of ovipositor sheath distinctly depressed; vein R_{2+3} not undulant opposite cross vein $r-m$ -----
scobinae, new species (p. 56).
 Ovipositor tip not more than 0.35 mm. long; rasper of smaller hooks rather abruptly terminated basally; ovipositor sheath not depressed apically; vein R_{2+3} slightly undulant opposite cross vein $r-m$ ----- 55
55. (54) Ovipositor tip less than 0.2 mm. long; hooks of rasper slender, closely set-----
kuhlmanni Costa Lima (p. 56).
 Ovipositor tip more than 0.3 mm. long; hooks of rasper long and stout, not so closely set-----
mucronota, new species (p. 57).
56. (19) Ovipositor tip elongate, broadened or protuberant at or near base of the minutely serrate portion and with a rounded protuberance near end of oviduct (fig. 10, A, B)----- 57
 Ovipositor tip not shaped in this fashion----- 58
57. (56) V band broadly joined to S band; macrochaetae orange; ovipositor sheath 5-5.5 mm. long-----
binodosa, new species (p. 57).
 V band separated from S band; macrochaetae black; ovipositor sheath 3.6-4.2 mm. long-----
palae, new species (p. 58).
58. (56) Ovipositor tip less than 0.06 mm. long----- 59
 Ovipositor tip more than 0.09 mm. long, and usually much longer----- 60

59. (58) Ovipositor less than 2.0 mm. long, gradually tapering from base to apex-----*montei* Costa Lima (p. 59).
Ovipositor more than 2.5 mm. long, very slender, with parallel sides save for the abruptly widened base and slightly swollen apical portion-----*panamensis* Greene (p. 59).
60. (58) Ovipositor with lateral serrations, visible at a magnification of 60 diameters, for more than half distance from apex to end of oviduct (except occasionally in *fraterculus*)----- 61
No serrations visible at this magnification, or serrations confined to apical half of ovipositor tip (except occasionally *sodalis*)----- 92
61. (60) Mesonotum yellow brown save for a strong, sharply defined, black median spot on or close to the scutocutellar suture; ovipositor either broad with a few very large serrations or broadly spatulate with very fine serrations----- 62
Mesonotum without black, with a diffuse brownish spot or band, or with the black much more extensive; if a small black spot present, the ovipositor tip differently shaped----- 65
62. (61) Ovipositor more than 3 mm. long, the tip with a few very large serrations----- 63
Ovipositor less than 2 mm. long, the tip with many fine serrations----- 64
63. (62) Ovipositor more than 5.5 mm. long-----*ramosa*, new species (p. 60).
Ovipositor less than 3.5 mm. long-----*subramosa*, new species (p. 61).
64. (62) Hyaline area on costa beyond stigma always crossing vein R_{2+3} and nearly always touching vein R_{4+5} (Texas to Panama)-----*spatulata*, new species (p. 61).
This hyaline area never crossing vein R_{4+5} and usually not reaching it (Florida)-----*interrupta*, new species (p. 62).
65. (61) Lateral serrations of ovipositor tip extending at least to level of apex of oviduct and usually somewhat more basad (in *passiflorae* the serrations minute and apex of oviduct not sharply defined)----- 66
Lateral serrations of ovipositor tip not extending to level of end of oviduct although some sublateral teeth may----- 74
66. (65) Base of ovipositor not abruptly widened; ovipositor less than 1.7 mm. long----- 67
Either base of ovipositor rather abruptly widened, or ovipositor more than 1.8 mm. long, or both----- 68
67. (66) Ovipositor tapering from base to apex, base of serrate portion scarcely angulate laterally-----*pickeli* Costa Lima, part (p. 63).
Ovipositor scarcely tapering from base to level of first serrations, base of serrate portion distinctly angulate laterally-----*manihoti* Costa Lima (p. 64).
68. (66) Ovipositor very short, the tip broad, minutely serrate, with the sides distinctly turned upward-----*alveata*, new species (p. 72).
Ovipositor more than 1.8 mm. long, the tip not as described----- 69
69. (68) Hooks of rasper with base of each elongate, longer than the projecting curved portion-----*rheediae*, new species (p. 65).
Hooks of rasper not so shaped----- 70
70. (69) Ovipositor tip less than twice as long as width at base of serrate portion----- 71
Ovipositor tip at least twice as long as width at base of serrate portion----- 72
71. (70) Ovipositor less than 3 mm. long; ovipositor tip angulate at base of serrate portion-----*tutzi* Costa Lima (p. 65).
Ovipositor more than 5 mm. long; ovipositor tip not angulate at base of serrate portion-----*passiflorae* Green (p. 66).
72. (70) Ovipositor sheath less than 3.5 mm. long----- 73
Ovipositor sheath more than 5.5 mm. long-----*amnis*, new species (p. 88).
73. (72) Macrochaetae orange brown; ovipositor tip as in figure 13, A-----*ethalea* (Walker) (p. 66).
Macrochaetae black; ovipositor tip as in figure 13, B-----*limae*, new species (p. 67).
74. (65) Ovipositor not more than 3.1 mm. long----- 75
Ovipositor not less than 3.3 mm. long----- 88

75. (74) Pile of mesonotum dark on sublateral stripes, pale yellowish on median pale area (best seen when looking across from side); ovipositor shorter than distance on vein M from base of M_2 to cross-vein $r-m$; ovipositor with about 12 rather sharp serrations, the basal ones not turned upward
mombinpraeoptans Sehn (p. 68).
 Pile of mesonotum almost uniformly yellowish brown, not contrasting; usually not agreeing with other characters mentioned----- 76
76. (75) Serrate margin of ovipositor tip turned upward proximally; (ovipositor about 1.5 mm. long)----- 77
 Serrate margin of ovipositor tip straight in lateral view, the proximal portion not turned upward----- 78
77. (76) The proximal upward flaring of the serrate margin of the ovipositor tip very pronounced, as though the tip had been pinched just beyond end of oviduct; tip with at least 18 serrations; macrochaetae nearly black-----*compressa*, new species (p. 70).
 The turning upward more gradual and not so pronounced; not more than 14 serrations; macrochaetae dark, but somewhat coppery-----*canalis*, new species (p. 71).----- 79
78. (76) Ovipositor with not more than 20 serrations----- 79
 Ovipositor with at least 25 serrations----- 87
79. (78) Ovipositor tip with about five very coarse serrations on each side and a few smaller ones-----*antunesi* Costa Lima (p. 73).
 Ovipositor with serrations more numerous, smaller and more regular----- 80
80. (79) Ovipositor about 1.5 mm. long, the tip distinctly narrowed beyond apex of oviduct; serrations rounded, occupying apical two-thirds of tip; V band usually joined to S band; usually a small black spot on scutoscutellar suture (Greater Antilles and Florida) (cf. *fraterculus*, couplet 85)
suspensa (Loew), in part (p. 74).
 Ovipositor longer or the tip differently shaped, or V band separated from S band (elsewhere)----- 81
81. (80) Apex of oviduct close to proximal serrations; (V band joined to S band)----- 82
 Apex of oviduct and proximal serrations more widely separated----- 83
82. (81) Ovipositor less than 2.0 mm. long-----*perdita*, new species (p. 76).
 Ovipositor more than 2.5 mm. long-----*acris*, new species (p. 77).
83. (81) Ovipositor 0.065 mm. wide; macrochaetae reddish yellow; (ovipositor sheath 2.4 mm. long)-----*fischeri* Costa Lima (p. 77).
 Ovipositor shaft at least 0.08 mm. wide; macrochaetae usually darker----- 84
84. (83) Ovipositor at least 2.5 mm long-----*irretita*, new species (p. 78).
 Ovipositor at most 2.2 mm. long----- 85
85. (84) Sides of metanotum rather broadly blackened; ovipositor tip with a distinct constriction basad of serrations, which occupy little more than half of tip; teeth of ovipositor rather blunt and rounded-----*fraterculus* (Wiedemann), part (p. 78).
 Either metanotum not blackened laterally or ovipositor tip different----- 86
86. (85) Ovipositor tip distinctly constricted between serrations and apex of oviduct, the serrations occupying apical three-fifths of ovipositor tip; V band rather broad at apex although pale yellow; sides of metanotum rarely darkened laterally
zuelaniae, new species (p. 82).
 Ovipositor tip scarcely constricted basad of serrations, these occupying little more than half of tip; arms of V band narrow anteriorly and usually separated at apex; sides of metanotum usually narrowly darkened-----*turpiniae*, new species (p. 83).
87. (78) Ovipositor not less than 2.5 mm. long; serrate portion elongate and a few basal teeth mediad of lateral margin
pseudoparallela (Loew) (p. 84).
 Ovipositor not more than 2.3 mm. long; serrate portion of tip shorter and all teeth on lateral margin
chiclayae Greene, part (p. 41).

88. (74)	Ovipositor less than 5 mm. long-----	89
	Ovipositor more than 5.5 mm. long-----	91
89. (88)	Serrations of ovipositor tip coarse, relatively few, not prominent <i>townsendi</i> Greene (p. 84).	
	Serrations of ovipositor tip numerous, fine-----	90
90. (89)	V band broadly joined to S band anteriorly; costal band and S band joined for some distance along vein R_{4+5} ; serrations of ovipositor tip extending basad nearly to end of oviduct <i>caudata</i> , new species (p. 85).	
	V band separated from S band; costal and S bands just touching; distance between base of serrate portion of ovipositor tip and apex of oviduct considerable----- <i>dukei</i> Costa Lima (p. 86).	
91. (88)	Ovipositor tip elongate, apex of oviduct rather remote from first serrations, the tip distinctly constricted in this intervening space----- <i>nigripalpus</i> Hendel (p. 87).	
	Ovipositor tip shorter, serrate portion beginning near end of oviduct, with no constriction <i>consobrina</i> (Loew), part (p. 87).	
92. (60)	Ovipositor with no serrations visible at magnification of 60 diameters-----	93
	Ovipositor with serrations visible, but confined to apical half of ovipositor tip-----	114
93. (92)	Cell M of wing orange yellow or yellow brown-----	94
	Cell M mostly hyaline-----	95
94. (93)	V band complete; cell R partially hyaline; apex of ovipositor acute----- <i>flavipennis</i> Greene (p. 89).	
	V band with distal arm nearly or quite absent; cell R entirely infuscated; apex of ovipositor roundedly truncate <i>fumipennis</i> Costa Lima (p. 90).	
95. (93)	Ovipositor not more than 2 mm. long-----	96
	Ovipositor more than 2.3 mm. long-----	100
96. (95)	A dark-brown transverse band on posterior margin of mesoscutum. Mesoscutum not so marked-----	97
	-----	98
97. (96)	S band deeply notched in cell Cu_1 , margin of band sharply angulate before notch; larger species, the wing at least 8 mm. long <i>robusta</i> Greene (p. 90).	
	S band with a shallow notch in cell Cu_1 , the margin rounded before it; small species, the wing at most 7.5 mm. long <i>nigrifascia</i> , new species (p. 91).	
98. (96)	V band separated from S band; ovipositor tip strongly compressed apically----- <i>buscki</i> , new species (p. 92).	
	V band joined to S band; ovipositor tip not strongly compressed apically-----	99
99. (98)	Macrochaetae of thorax black----- <i>crebra</i> , new species, part (p. 45).	
	Macrochaetae of thorax yellow brown <i>quararibae</i> Costa Lima, part (p. 44).	
100. (95)	Ovipositor more than 6 mm. long-----	101
	Ovipositor less than 5 mm. long-----	102
101. (100)	Wing bands dark brown and all bands connected; ovipositor less than 7 mm. long, moderately stout----- <i>concava</i> Greene (p. 93).	
	Wing bands mostly yellowish and V band only rarely and narrow- ly connected to S band; ovipositor usually more than 8 mm. long, very slender----- <i>zeteki</i> Greene (p. 94).	
102. (100)	V band incomplete, but the anterior angle present-----	103
	V band complete, or, if incomplete, the break at the apex or one arm completely missing-----	104
103. (102)	V band lacking a section of proximal arm in center of cell R_5 <i>fractura</i> , new species (p. 95).	
	V band lacking the posterior portion of the distal arm in cell second M----- <i>lutea</i> , new species (p. 95).	
104. (102)	Ovipositor tip narrowed rather abruptly beyond end of oviduct, producing a slightly concave lateral margin-----	105
	Ovipositor tip evenly tapering, the sides not concave-----	107
105. (104)	Distal arm of V band greatly reduced or absent; ovipositor tip more than 0.5 mm. long----- <i>galbina</i> , new species (p. 96).	
	V band complete; ovipositor tip less than 0.3 mm. long-----	106

- 106 (105) Ovipositor tip elongate, the apex acute, and no distinct swelling opposite end of oviduct-----*bondari* Costa Lima (p. 98).
Ovipositor tip short, the apex blunt, and a distinct swelling opposite end of oviduct-----*tumida*, new species (p. 98).
107. (104) Wing bands brown, particularly on basal half; S band with a narrow posterior extension across cell Cu₁ to hind margin; a dark band in front of scutoseutellar suture
speciosa, new species (p. 100).
Wing bands predominantly yellow orange, the pattern not as shown in pl 21, B; no dark band in front of scutoseutellar suture----- 108
108. (107) Ovipositor tip less than 0.2 mm. long; all wing bands rather broadly connected-----*cryptostrepha* (Hendel (p. 101).
Ovipositor tip more than 0.3 mm. long; where less than 0.4 mm. long, either the V band separated from the S band or the costal and S bands little more than touching----- 109
109. (108) Ovipositor tip about one-fifth total length of ovipositor
inca, new species (p. 101).
Ovipositor tip at most one-eighth total length of ovipositor----- 110
110. (109) Macrochaetae orange yellow; ovipositor usually more than 3.8 mm. long-----*sylicola* Knab (p. 102).
Macrochaetae black; ovipositor usually less than 3.8 mm. long----- 111
111. (110) Wing rounded apically; teeth of rasper numerous, closely set; no black on side of metanotum; V band joined to S band
sodalis, new species (p. 102).
Wing narrowed apically; teeth of rasper not so numerous, set farther apart; metanotum blackened laterally, or, if not, V band separated from S band----- 112
112. (111) No black on metanotum; V band separated from S band; ovipositor at least 3.5 mm. long-----*teretis*, new species (p. 103).
Metanotum darkened laterally; V band joined to S band, or, if separated, ovipositor less than 3 mm. long----- 113
113. (112) V band joined to S band; ovipositor about 3.25 mm. long, the tip with margins quite smooth, the apex rather acute
quinac Costa Lima (p. 104).
V band separated from S band; ovipositor about 2.5 mm. long, the tip somewhat roughened laterally, the apex somewhat truncate-----*distincta* Greene, part (p. 106).
114. (92) Ovipositor tip about one-fourth total length of ovipositor
extensa, new species (p. 104).
Ovipositor tip not more than one-sixth total length of ovipositor----- 115
115. (114) Ovipositor longer than posterior margin of cell first M₂----- 116
Ovipositor shorter than posterior margin of cell first M₂----- 119
116. (115) Postscutellum with a distinct dark spot laterally, sometimes extending down onto metanotum
ludens (Loew). part (p. 97).
Metanotum and postscutellum not darkened laterally, or, if darkened, not darkest on postscutellum----- 117
117. (116) Distal arm of V band rather broad, the distal margin decidedly convex and the apex of the V band broad, narrowly joined to S band-----*lathana*, new species (p. 105).
Distal arm of V band narrow and nearly straight, often separated from proximal arm and V band usually separated from S band----- 118
118. (117) Ovipositor less than 3.5 mm. long; metanotum blackish laterally
distincta Greene, part (p. 106).
Ovipositor more than 3.5 mm. long; metanotum only rarely darkened laterally-----*macra*, new species (p. 108).
119. (115) Mesoscutum without median yellow stripe; metanotum uniformly orange brown; serrations of ovipositor tip confined to apical fourth or less-----*barbiellinii* Costa Lima (p. 108).
Mesoscutum with median yellow stripe; sides of metanotum distinctly blackened; serrations of ovipositor tip occupying most of apical half-----*bahicnsis* Costa Lima, part (p. 107).

DESCRIPTIONS OF SPECIES

ANASTREPHA BEZZII Costa Lima

Anastrepha bezzii Costa Lima, Inst. Oswaldo Cruz Mem. 28: 498, fig. 5, pl. 64, fig. 8, 1934; O Campo 8 (92): 63, 1937.

Large, yellowish. Mesonotum 4.75 mm. long. Wing 10.75 mm. long, the pattern pale yellowish brown; cell R_1 completely infuscated, with only a faint paler spot at apex of vein R_1 ; proximal portion of S band somewhat indistinct and broken; only proximal arm of V band present, and this extending very little into cell R_3 ; veins R_{2+3} and R_{4+5} both undulant, so that cell R_3 is considerably widened opposite cross vein $r-m$ and strongly constricted a short distance distad of this cross vein; vein M_{1+2} reaching apex of S band. *Female terminalia*: Ovipositor sheath 12.5 mm. long. *Male terminalia*: Tergal ratio distinctly more than 1.0; clasper about 0.32 mm. long, stout, the apex blunt; teeth subapical.

Type material.—Holotype male (Instituto Oswaldo Cruz).

Type locality.—Manguinhos, Rio de Janeiro, Brazil.

Distribution.—Rio de Janeiro and Goyaz, Brazil.

Food plant.—Unknown.

The writer has not seen this species, the foregoing description being based upon the original description of the male and the later description of the female. If the female described above is properly referred here, this species differs from all those with a similar color pattern by the unusually long ovipositor sheath. The new species *balloui* appears to be most closely related to it.

ANASTREPHA BALLOUI, new species

(Fig. 1, A and B; pl. 1, A)

Medium sized to rather large, yellow brown. One upper fronto-orbital bristle. Mesonotum 3.65–4.1 mm. long, pale yellow, with two pairs of orange-yellow stripes, the first submedian, from anterior margin to a short distance beyond transverse suture, the second sublateral, from transverse suture nearly to scutellum. Metanotum entirely orange brown. Macrochaetae brownish black; pile yellow orange. No sternopleural bristle. Wing 8–9.2 mm. long, the bands faint, yellow brown. Cell R_1 entirely colored, sometimes paler at apex of vein R_1 , but with no distinct hyaline spot; a hyaline space between costal and S bands in cell R_3 ; distal arm of V band absent, the proximal arm fading anteriorly before reaching vein R_{4+5} ; vein R_{2+3} somewhat undulant; vein M_{1+2} touching wing margin at apex of S band. *Female terminalia*: Ovipositor sheath 6.6–7.0 mm. long, very slender, the spiracles about 1.55 mm. from base. Rasper unusually elongate, 1.8 mm. when fully extended, the teeth rather short and stout, longest on basal half (fig. 1, A). Ovipositor 6.1 mm. long, moderately stout, the base scarcely widened, tip slender, tapering, with no serrations; apex of oviduct swollen, the orifice bordered with long hairs. *Male terminalia*: Tergal ratio about 1.67; clasper about 0.26 mm. long, stout, the outer margin convex, the tip blunt; teeth subapical.

Type material.—Holotype female (United States National Museum No. 51652); paratypes, 6 females and 11 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—San Juan de Los Morros, Venezuela.

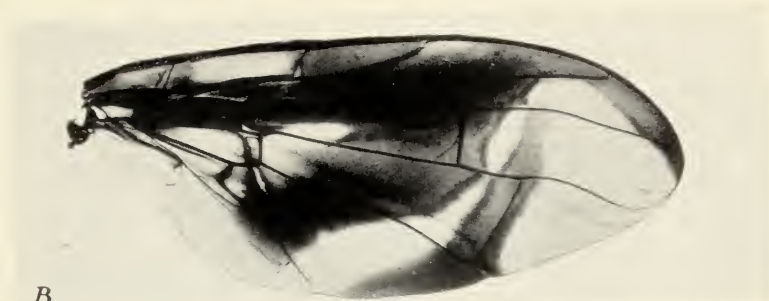
Distribution.—Venezuela and Panama.

Food plant.—Unknown.

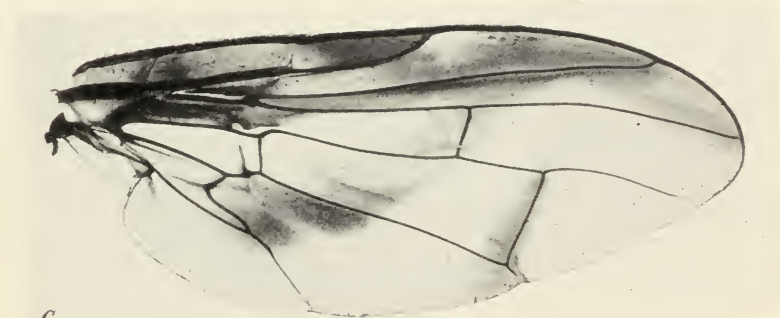
All the specimens except one male paratype were collected on *Terminalia catappa*, April 12, 1938, by C. H. Ballou, in whose honor the species is named. The excepted paratype was trapped at El Cermño, Panama, June 13, 1939, by James Zetek.



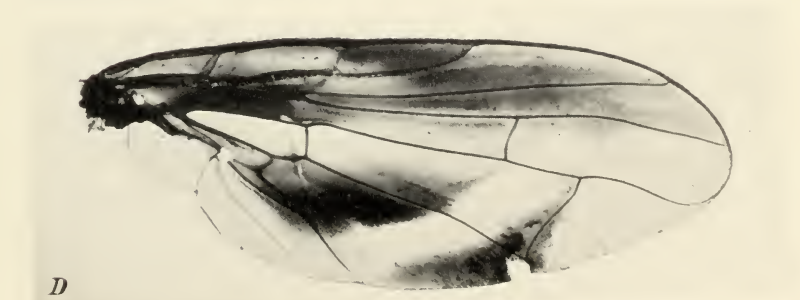
A



B

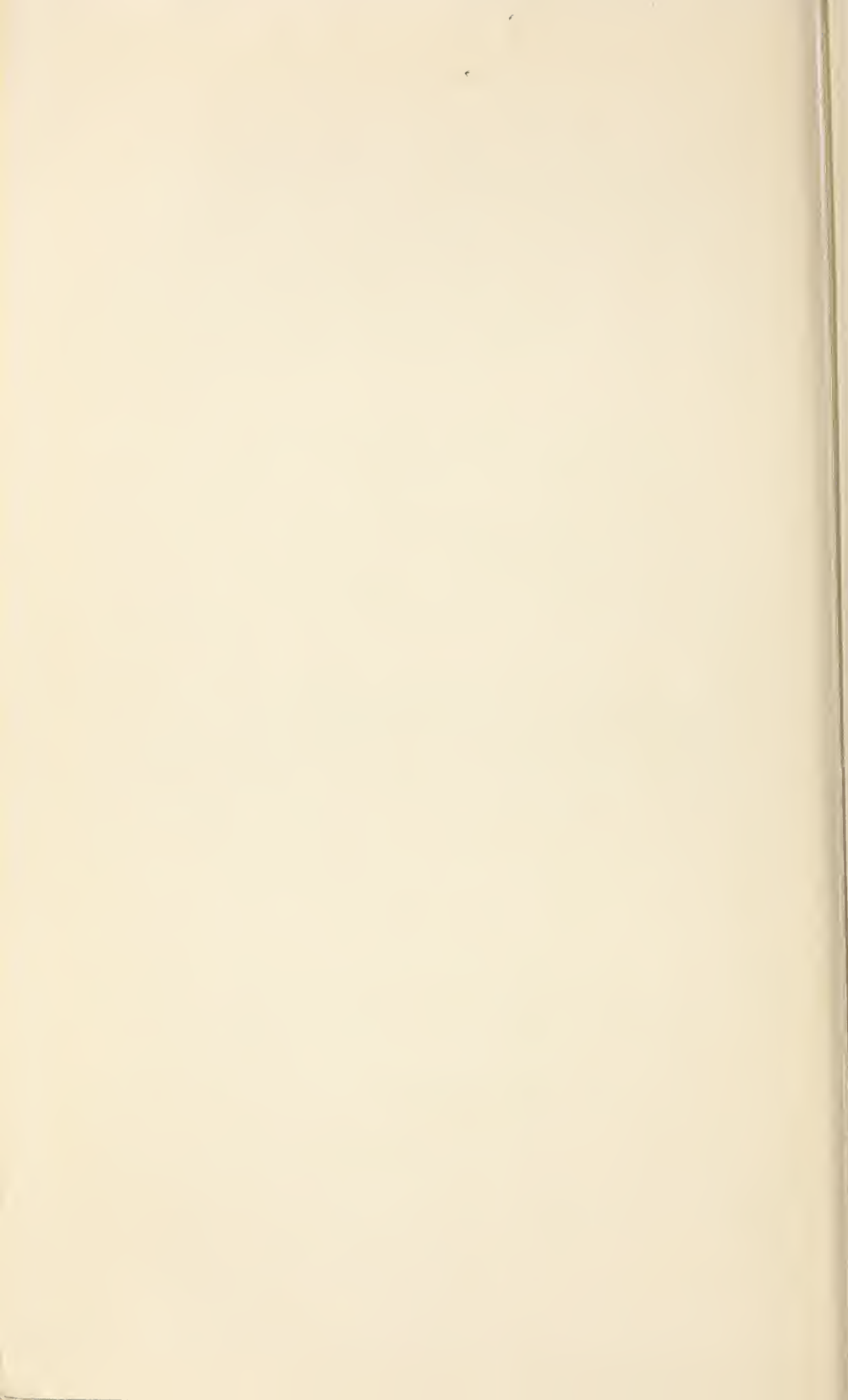


C



D

Wing of (A) *Anastrepha balloui*, (B) *A. atrigona*, (C) *A. grandis*, and (D) *A. shannoni*.



This species closely resembles *bezzii* in wing pattern, venation, and general appearance, but if Costa Lima has correctly identified the female of *bezzii* it has the ovipositor sheath much longer. The unusually elongate rasper is a striking feature of *balloui*.

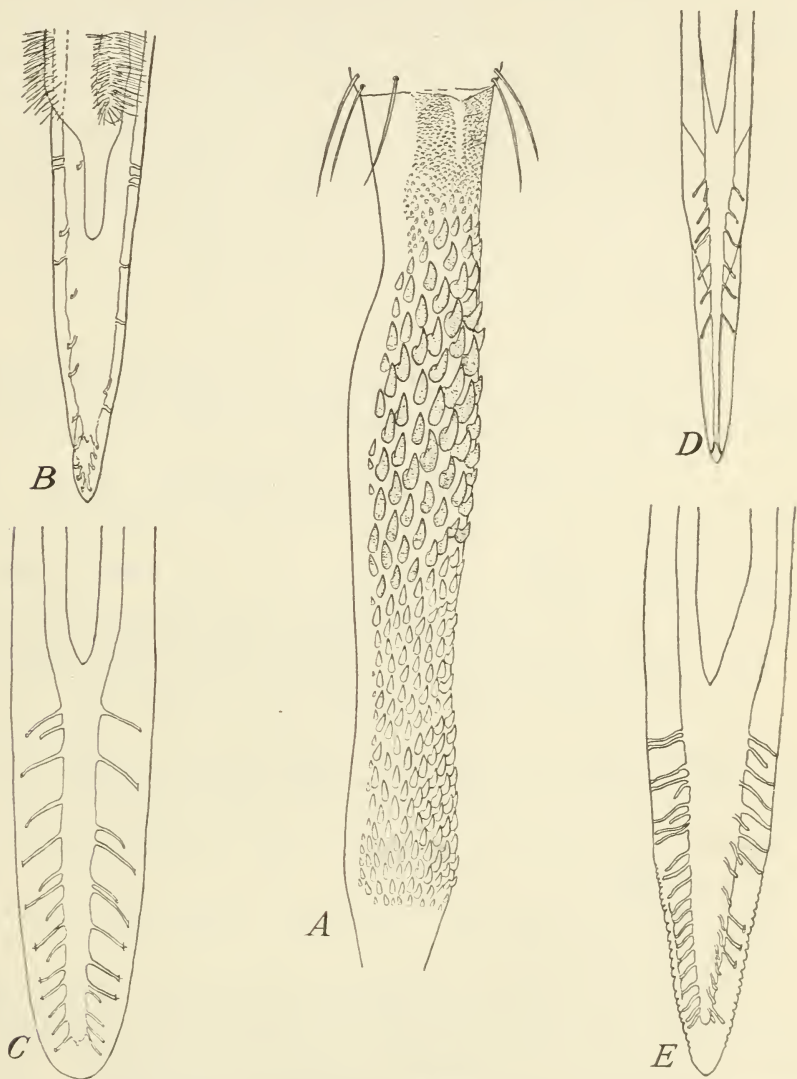


FIGURE 1.—Rasper of (A) *Anastrepha balloui*; ovipositor tip of (B) *A. balloui*, (C) *A. atrigona*, (D) *A. grandis*, and (E) *A. ocrea*.

ANASTREPHA ATRIGONA Hendel

(Fig. 1, C; pl. 1, B)

Anastrepha atrigona Hendel, [Dresden] K. Zool. u. Anthropol.-Ethnol. Mus. Abhandl. u. Ber. 14 (3): 15 and 20, pl. 1, fig. 8, 1914; Greene, Wash. Ent. Soc. Proc. 36: 146, pl. 19, fig. 9, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 499, 1934

Rather large, predominantly orange brown. One specimen has a blackish median spot on lower margin of frons. Mesonotum 3.58–4.0 mm. long. Humerus, median stripe widening on scutum posteriorly, lateral stripe from just before transverse suture to scutellum, and scutellum pale yellow; occasionally an indistinct dark spot before scutellum; pleura yellow brown, a stripe below notopleuron and most of metapleuron pale yellow; metanotum brownish black, with a median orange-brown stripe. Macrochaetae black; pile brownish, paler medianly than on scutum. Sternopleural bristle very weak. Wing 8.6–9.24 mm. long, the bands brown; no distinct hyaline spot on costal margin beyond apex of vein R_1 ; V band with no distal arm, the proximal arm narrowly joined to S band anteriorly and rather broadly in cell first M_2 . *Female terminalia*: Ovipositor sheath 4.22–4.55 mm. long, tapering posteriorly to apical two-fifths, the spiracles about 1.2 mm. from base. Rasper well developed, the hooks in five or six rows. Ovipositor (only one mounted) 4.06 mm. long, the tip blunt with no serrations; extreme base abruptly widened. *Male terminalia*: Tergal ratio about 1.2; clasper about 0.27 mm. long, stout, the outer margin nearly straight, the apical third flattened and tapering to an acute apex; teeth slightly distad of middle.

Type material.—Holotype male (Vienna Museum).

Type locality.—Surinam.

Distribution.—Surinam and Brazil (Amazon River).

Food plant.—Unknown.

The above description is based upon the type kindly loaned to the writer by Dr. Beier, of the Vienna Museum, and five females and two males collected at various places on the Amazon River.

ANASTREPHA BIVITTATA (Macquart)

Urophora bivittata Macquart, Diptères Exotiques Nouveaux ou Peu Connus, v. 3, p. 227, pl. 30, fig. 3, 1843.

Acrotoxa bivittata (Macquart): Loew, Smithsn. Inst. Misc. Collect. 11 (256): 231, pl. 11, fig. 27, 1873.

Anastrepha bivittata (Macquart): Bezzi, Portici R. Scuola Super. di Agr. Lab. Zool. Gen. e Agr. Bol. 3: 284, 1909; Chacaras e Quintaes 19: 374, fig. 2 (3) 1919; Hendel, [Dresden] K. Zool. u. Anthrop.-Ethnog. Mus. Abhandl. u. Ber. 14 (3): 15, 1914; Greene, Wash. Ent. Soc. Proc. 36: 157, pl. 21, fig. 7, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 499, 1934.

Small, yellow brown, the thorax with two darker-brown stripes. Basal portion of wing entirely infuscated, a small hyaline triangle at apex of vein R_1 ; V band with distal arm absent, the proximal arm diffuse, narrowly separated from S band. *Female terminalia*: Ovipositor sheath rather slender, slightly shorter than abdomen.

Type material.—Holotype female (perhaps in Paris Museum, according to Bezzi).

Type locality.—Unknown. Hendel gives Brazil without stating reason.

Food plant.—Unknown.

This species has not been recognized by the writer. It resembles *atrigona* and *fumipennis*, but differs in the length of the ovipositor and in being much smaller. Unless the original description and figure are extremely faulty, it is probable that this is a valid species. Until the type can be studied, however, the species will probably remain unrecognized.

ANASTREPHA GRANDIS (Macquart)

(Fig. 1, D; pl. 1, C)

Tephritis grandis Macquart, Diptères Exotiques Nouveaux ou Peu Connus, Sup 1, p. 212, pl. 18, fig. 14, 1846.

(*Trypeta*) *Acrotoxa grandis* (Macquart): Loew, Smithsn. Inst. Misc. Collect. 11 (256): 231, pl. 11, fig. 26, 1873.

Anastrepha grandis (Macquart) : Bezzi, Portici R. Scuola Super. di Agr. Lab. Zool. Gen. e Agr. Bol. 3: 284, 1909; *ibid.* 13: 6, 1919; Chacaras e Quintaes 19: 374, fig. 2 (2), 1919; Fischer, Rev. de Ent. 2: 302, figs. 1-10, 1932; *ibid.*, 4: 17, figs 1-8, 1934; Greene (in part), Wash. Ent. Soc. Proc. 36: 145, pl. 19, fig. 7, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 496, figs. 3-4, pl. 64, figs. 6-7, pl. 74, fig. 56, 1934; O Campo 8 (92): 63, 1937; Blanchard, Soc. Ent. Argentina Rev. 9: 41, 1937.

Anastrepha schineri Hendel, [Dresden] K. Zool. u. Anthropol.-Ethnogr. Mus. Abhandl. u. Ber. 14 (3): 19, 1914.

Anastrepha latifasciata Hering, Stettin. Ent. Ztg. 96: 227, fig. 2, 1935.

Rather large to large, yellow brown, with yellow and dark-brown markings. Mesonotum 3.3-4.0 mm. long, yellow brown, with humerus, median stripe widening from just before transverse suture to side of scutellum, lateral stripes from just before transverse suture to side of scutellum, stripe below notopleuron, metapleuron, and scutellum except extreme base yellow; a sublateral stripe from level of humeral bristle to scutellum, broken at transverse suture, a band along scutoscuteellar suture, intensified medially, and a spot on pteropleuron dark brown; metanotum blackened laterally. Macrochaetae dark brown; pile yellowish brown. No sternopleural bristle. Wing 9.0-10.5 mm. long, the bands yellow brown, rather diffuse; costal and S bands broadly connected, and no distinct hyaline spot anterior to vein R_{4+5} ; distal arm of V band absent, the proximal arm not joining S band. *Female terminalia*: Ovipositor sheath 5.8-6.2 mm. long, tapering posteriorly to apical third, which is distinctly depressed and broadened; in profile the sheath is distinctly concave dorsally on median half and concave ventrally on apical third. Rasper well developed, of slender, curved hooks in five or six rows. Ovipositor slightly longer than length of ovipositor sheath, being somewhat curved dorsoventrally to permit this; tip long and slender, without serrations; extreme base slightly widened. *Male terminalia*: Tergal ratio about 0.95; clasper about 0.36 mm. long, stout, the portion distad of teeth slightly flattened, curved inward, the apex blunt; teeth slightly distad of middle.

Type material.—Holotype of *grandis*, female (Bigot Collection); holotype of *schineri*, male (Hungarian National Museum); holotype of *latifasciata*, female (Stettin Museum).

Type localities.—Of *grandis*, Colombia (New Grenada); of *schineri*, Corioca, Bolivia; of *latifasciata*, Santa Catharina, Brazil.

Distribution.—Panama, Colombia, Brazil, Paraguay, Bolivia, and Argentina.

Food plants.—*Cucurbita pepo*, *Cucumis sativus*, and *Citrullus vulgaris*. The record of rearing from oranges (Greene 1934) is erroneous.

Fischer (1932) placed *schineri* in synonymy. Greene examined specimens so determined by Hendel, and confirmed the synonymy. Costa Lima (1937) considered *latifasciata* to be a synonym of *grandis*, and a specimen sent by the writer to Hering was returned, bearing the label, "*A. grandis* f. *latifasciata*." The writer can find no justification for using the name *latifasciata*, even subspecifically. Fischer (1934) made a careful study of the cephalic chaetotaxy in this species, pointing out considerable variation in the number and position of the bristles. The species may be distinguished from its relatives, *bezzii*, *atrigena*, and *shannoni*, new species, by the characters given in the key. The last species was determined as *grandis* by Greene. This species would seem to be potentially of economic importance in Florida and southern Texas should it ever be introduced there.

ANASTREPHA SHANNONI, new species

(Pl. 1, D)

Anastrepha grandis Greene (in part, not Macquart), Wash. Ent. Soc. Proc. 36: 145, 1934.

Rather large, yellow brown, marked with black. Mesonotum 3.9 mm. long, predominantly brownish black, with yellow brown as follows: A slender median line from anterior margin, widening rather abruptly at posterior third to include acrostichal bristles, but not attaining scutoscuteellar suture; a very slender, indistinct line from inner angle of humerus to dorsocentral bristle; humerus and a narrow stripe to transverse suture and continuing broader to hind margin; border of transverse suture from notopleuron to dorsocentral line; and all but base of scutellum. Pleura brownish black except for yellow brown on dorsal and posterior portion of mesopleuron, dorsal stripe on sternopleuron, area around wing base, all but posterior third of hypopleuron, and metapleuron. Metanotum black, with a median yellow-brown stripe. Macrochaetae black; pile black on dark areas, yellowish on light areas. No sternopleural bristle. Wing 8.58 mm. long, the pattern brown, much as in *grandis*, but cell R entirely infuscated and proximal area of V band scarcely reaching cell R_{4+5} , but extending along hind margin of wing in cell Cu_1 for nearly entire width of cell. Abdomen yellow brown, darkened laterally on tergites 1-4. *Male terminalia*: Tergal ratio about 1.0; clasper about 0.44 mm. long, stout basally, the apical portion flattened, tapering to a rather blunt apex; teeth about at middle.

Type material.—Holotype male (United States National Museum No. 51653).

Type locality.—Chimbotes, Amazonas, Peru.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

The single specimen from which this species is described is a somewhat moldy one that was considered by Greene to be *grandis*. It differs from *grandis* in wing and thoracic patterns as indicated in the key, and, in addition, the aedeagus of *grandis* is considerably longer and the claspers decidedly shorter and blunter than in this species.

ANASTREPHA OCRECIA (Walker)

(Fig. 1, E; pl. 2, A)

Trypeta ocrecia Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 4, p. 1016, 1849; Loew, Smithsn. Inst. Misc. Collect. 6 (1): 60, 1862.

Acrotoxa ocrecia (Walker); Loew, Smithsn. Inst. Misc. Collect. 11 (256): 231 and 337, 1873.

(*Trypeta*) *Acrotoxa tricineta* Loew, Smithsn. Inst. Misc. Collect. 11 (256): 225, 227, and 329, 1873. (New synonymy.)

Anastrepha ocrecia (Walker): Aldrich, Smithsn. Inst. Misc. Collect. 46 (1444): 602, 1905; Hendel, [Dresden] K. Zool. u. Anthropol.-Ethnol. Mus. Abhandl. u. Ber. (14) 3: 14, 1914; Bates, Brooklyn Ent. Soc. Bul. 28: 162, 1933; Greene, Wash. Ent. Soc. Proc. 36: 158, pl. 21, fig. 8, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 525, pl. 67, fig. 22, 1934.

Anastrepha tricineta (Loew): Aldrich, Smithsn. Inst. Misc. Collect. 46 (1444): 602, 1905; Hendel, [Dresden] K. Zool. u. Anthropol.-Ethnol. Mus. Abhandl. u. Ber. (14) 3: 14, 1914; Bates, Brooklyn Ent. Soc. Bul. 28: 161, 1933; Greene, Wash. Ent. Soc. Proc. 36: 146, pl. 19, fig. 10, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 512, 1934; Brown, Fla. State Plant Bd. Bien. Rpt. 11: 21, 1937.

Rather small, orange brown, marked with pale yellow and brownish black. Mesonotum 3.0-3.4 mm. long. Thorax orange brown, with pale-yellow and black markings. Pale-yellow markings consisting of a narrow median stripe, widening posteriorly to include acrostichal bristles but not reaching scutellum; humerus; a marking along transverse suture; a narrow stripe from transverse suture to hind margin of mesoscutum; all but base of scutellum; a stripe below notopleuron to wing base; and most of metapleuron. Black markings consisting of a median spot lying in a brownish band on scutoscuteellar suture, acute anteriorly, usually notched posteriorly; and metanotum except for a narrow median stripe. Macrochaetae black; pile pale yellowish. Sternopleural bristle moderately to very slender. Wing 6.6-7.5 mm. long, the pattern brown; costal and S bands connected, the costal hyaline spot usually not touching vein R_{4+5} ; proximal arm of V band usually extending forward to vein R_{4+5} but not joined to S band;



A



B

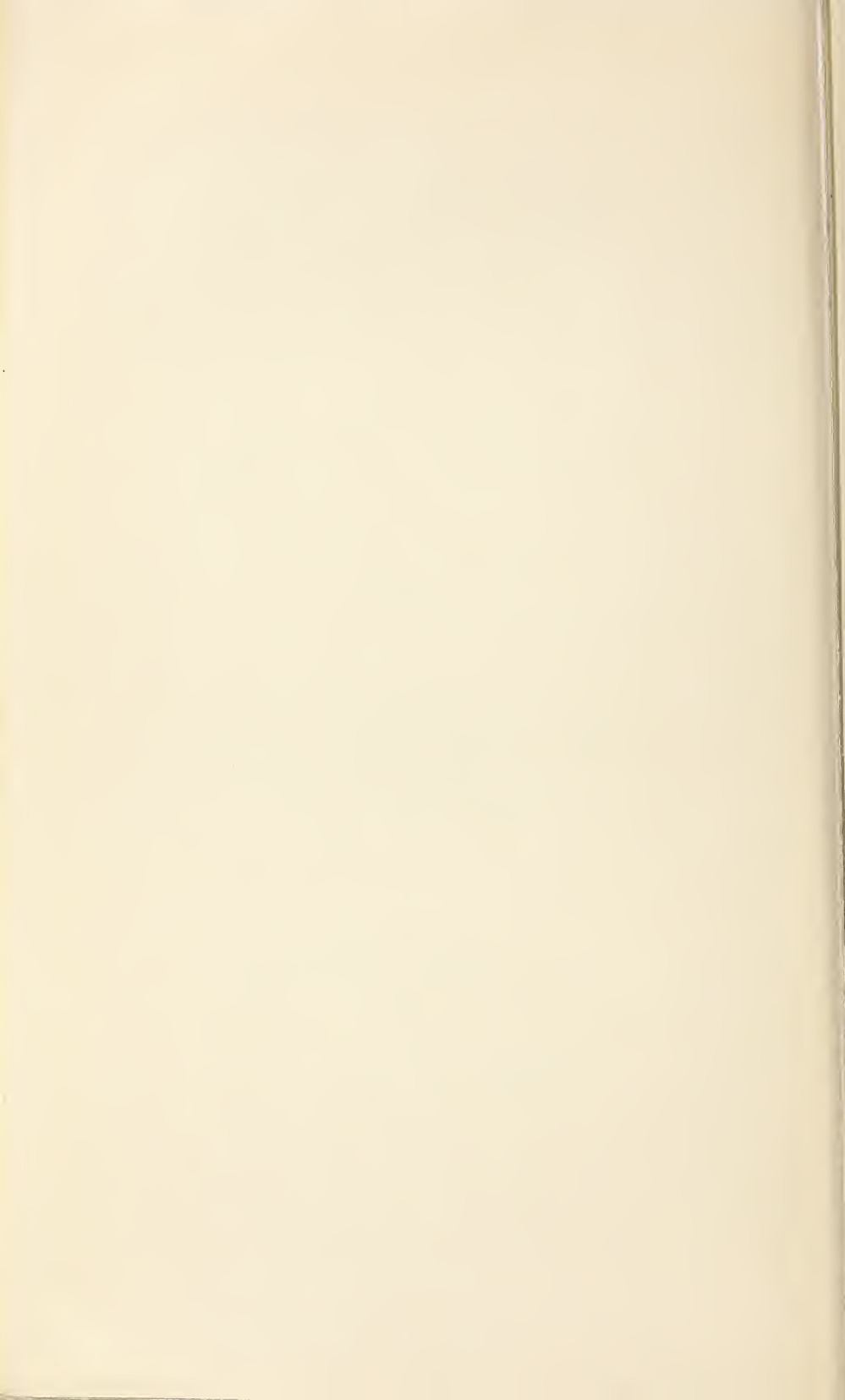


C



D

Wing of (A) *Anastrepha ocreata*, (B) *A. ornata*, (C) *A. pulchra*, and (D) *A. serpentina*.



distal arm short, curved, either separated from proximal arm or joining it at vein M_{1+2} . Abdomen orange brown, with transverse brownish-black bands on tergites 2-4 basally, not reaching lateral margins, and those on tergites 3-4 narrowed or broken medially. *Female terminalia*: Ovipositor sheath 3.6-3.9 mm. long, tapering to posterior third, which is somewhat depressed; spiracles about 1.1 mm. from base. Rasper of rather stout hooks in five or six rows. Ovipositor 3.3 mm. long, stout, with many fine, blunt teeth on a little more than posterior half. *Male terminalia*: Tergal ratio about 1.08; clasper about 0.37 mm. long, stout basally, flattened apically, the apical portion tapering to an acute apex; teeth slightly proximad of middle.

Type material.—Holotype of *ocresia*, female (British Museum); holotype of *tricincta*, male, Museum of Comparative Zoology, Cambridge).

Type localities.—Of *ocresia*, Jamaica; of *tricincta*, on shipboard, 60 miles northwest of St. Nicholas, Haiti.

Distribution.—Florida, Cuba, Jamaica, and Hispaniola.

Food plant.—Unknown.

The Florida records are from Rock Harbor, Key Largo, July 7, 1936, and from Key West. Except for the type, the species has not been collected on Jamaica. Other specimens are from the Isle of Pines, the eastern and western tips of Cuba, and Santo Domingo City, Hispaniola.

The writer studied the type of *tricincta* and then sent Dr. Smart a female to be compared with the type of *ocresia*. Dr. Smart considered the specimen sent to be the same species as the type. Miss Aubertin also studied the type of *ocresia* for Dr. Costa Lima and noted that the palpi were yellow, not pitchy as described by Walker. The wing length of 8 mm. and ovipositor-sheath length of 4 mm., as given by Aubertin, are slightly greater than in any specimens seen by the writer. There appears to be no reason for doubting the synonymy. There is some variation in the size of the dark spot on the scutoscuteellar suture and in the shape of both arms of the V band of the wing.

ANASTREPHA ORNATA Aldrich

(Fig. 2, A; pl. 2, B)

Anastrepha ornata Aldrich, U. S. Natl. Mus. Proc. 66 (18): 6, 1925; Greene, Wash. Ent. Soc. Proc. 36: 143, pl. 19, fig. 2, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 495, 1934.

Medium sized, brownish black, with yellow markings. Head orange brown, the dorsal portion of the postgena somewhat darkened. Mesonotum 3.03-3.41 mm. long. Thorax brownish black, with yellow markings as follows: A slender median stripe widening posteriorly just to include the acrostichal bristles; humerus; border of the transverse suture, particularly anteriorly; a sublateral stripe from just behind dorsal angle of notopleuron nearly to side of scutellum; posterior two-thirds of scutellum; a stripe below notopleuron widening posteriorly to extend along hind margin of mesopleuron; upper portion of sternopleuron except posteriorly; dorsal and anterior portion of hypopleuron; and all but posteroventral portion of metapleuron. A subquadrate orange-brown spot on the disk of the mesoscutum, lying between the two halves of the transverse suture and usually concave posteriorly, is clothed with rather dense, pale-yellowish pile. Middle of postscutellum, sometimes extending onto metanotum, yellowish brown. Macrochaetae black; pile of dark portions dorsally blackish brown, the rest pale yellowish. Sternopleural bristle well developed. Wing 8.0-8.5 mm. long, the pattern predominantly dark brown; costal band split longitudinally by a pale-yellow area; costal and S bands widely separated; S band slender; only proximal arm of V band present, and this very slender, evanescent anterior to vein M_{1+2} , and widely separated from S band. Abdomen orange brown, with most of tergite 1 and anterior portion of tergites 2-3 widened

laterally, dark brown. *Female terminalia*: Ovipositor sheath 3.8 mm. long, the basal two-thirds rather stout, the apical third slightly depressed; spiracles about 1.3 mm. from base. Rasper of rather long, curved hooks in about four rows. Ovipositor 3.75 mm. long, rather stout, the tip stout, tapering to a blunt apex, with no serrations. *Male terminalia*: Tergal ratio about 1.0; clasper about 0.4 mm. long, moderately narrow basally, the apical portion greatly flattened and broad, with a broadly rounded apex, the apical portion wider than the basal portion; teeth decidedly proximad of middle.

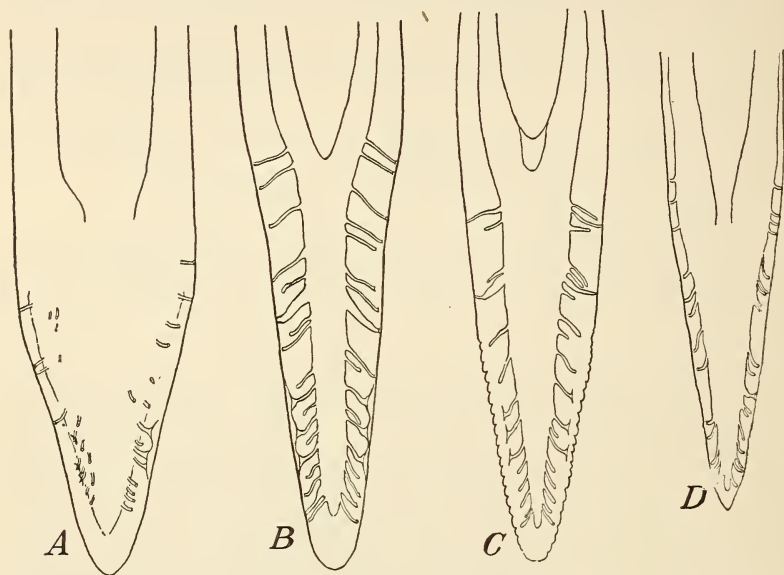


FIGURE 2.—Ovipositor tip of (A) *Anastrepha ornata*, (B) *A. pulchra*, (C) *A. serpentina*, and (D) *A. anomala*

Type material.—Holotype female and allotype (United States National Museum).

Type locality.—Baños, Oriente, Ecuador.

Distribution.—Ecuador.

Food plants.—*Pyrus communis*, *Psidium* sp.? Of four specimens from F. Campos R., collected at Ambato, Ecuador, two bear the label "in fruit of *Pyrus communis*" and two others the label "*Psidium* sp." It is not known whether the latter were reared from *Psidium* or only collected on it.

The species resembles *serpentina*, but differs in wing pattern, and the terminalia of both sexes are much more like those of *striata* than of *serpentina*.

ANASTREPHA PULCHRA, new species

(Fig. 2, B; pl. 2, C)

Medium sized to rather large, orange brown, marked with dark brown and yellow. Mesonotum 3.3–3.9 mm. long. Dorsum of thorax dark brown, with yellow markings as follows: A rather broad median stripe from anterior margin to acrostichal bristles, narrowest anteriorly and somewhat widened at level of anterior notopleural bristles and at acrostichal bristles; an indistinct line from anterior margin to dorsocentral bristle; humerus; a band in front of transverse suture; a rather broad stripe from transverse suture nearly to

scutellum, leaving a narrow dark band laterally; and posterior portion of scutellum, the dark basal area with convex hind margin. Pleura yellow, with disk of mesopleuron and most of pteropleuron dark brown, and in male a faint infuscation on disk of sternopleuron. Metanotum dark brown, with a narrow median orange-brown stripe. Macrochaetae black; pile of dorsum of thorax mostly dark brown, the median yellow stripe, a transverse prescutal area, and yellow portion of scutellum with yellow pile. Sternopleural bristle very slender. Wing 7.5–8.6 mm. long, the pattern predominantly dark brown; costal band largely yellowish, coalescent with **S** band for entire length of cell **R**; distal portion of **S** band very slender, the angle at costa abrupt; only proximal arm of **V** band present, this very slender, separated from **S** band and narrowly extending along hind margin of wing to anal vein. Female with tergites 1–3 yellow, with dark-brown basal bands, that on tergite 1 broken medially, those on 2 and 3 widening laterally; tergite 4 orange medially, darker brown laterally. Male with tergites 1–4 yellow with dark-brown basal bands on 2–4, widening laterally; tergite 5 entirely orange. *Female terminalia*: Ovipositor sheath 4.9–5.5 mm. long, tapering to apical third and then slightly widening to apex, the spiracles about 1.33 mm. from base. Rasper of rather stout hooks in five or six rows. Ovipositor 4.8–5.5 mm. long, moderately stout, the base abruptly widened, the tip slightly narrowed beyond end of oviduct, tapering to rather blunt apex, with no serrations. *Male terminalia*: Tergal ratio about 1.1; clasper about 0.4 mm. long, stout basally, tapering apically to a rather acute apex; teeth about at middle.

Type material.—Holotype female; paratypes, 5 females, 1 male (United States National Museum No. 51654).

Type locality.—La Campana, Panama.

Distribution.—Panama.

Food plant.—Unknown.

The holotype was trapped at La Campana, May 2, 1939, by James Zetek; the paratypes were trapped at the same locality, and at El Cerneco, Panama, from May 16 to June 5 and on October 17.

This species, a relative of *serpentina*, is remarkable for the large discal spot on the wing caused by the broad fusion of the costal and **S** bands.

ANASTREPHA SERPENTINA (Wiedemann)

(Fig. 2, *C*; pl. 2, *D*)

Dacus serpentinus Wiedemann, Aussereuropäische Zweiflügelige Insekten, v. 2, p. 521, 1830.

Leptoxyys serpentina (Wiedemann): Macquart, Diptères Exotiques Nouveaux ou Peu Connus, v. 2, subdiv. 3, p. 373 [1843].

Urophora vittithorax Macquart, Diptères Exotiques Nouveaux ou Peu Connus, suite du sup. 4, p. 259, pl. 26, fig. 11, 1851.

Anastrepha serpentina (Wiedemann): Schiner, Reise der Novara, Diptera 2, p. 263, 1868; Hendl, [Dresden] K. Zool. u. Anthropol.-Ethnogr. Mus. Abhandl. u. Ber. 14 (3): 14, 1914; Tavares, Brotéria, Ser. Zool. 13: 52–54, 1915; Costa Lima, [Brazil] Min. da Agr., Indus. e Com., Bol. 4 (3): 99–104, fig. 9, 1915; Bezzi, Portici, R. Scuola Super. di Agr. Lab. Zool. Gen. e Agr. Bol. 13: 7, 1919; Chacaras e Quintaes 19: 374, fig. 2 (4), 1919; Greene, Jour. Agr. Res. 38: 497, figs. 2, *E*, 3, *J*, 5, *E*, 6, *J*, 1929; Emmart, Wash. Ent. Soc. Proc. 35: 184–191, pls. 7–8, 1933; Dampf, Irrig. en Mex. 7: 262, figs. 1, 6, 12, 1933; Greene, Wash. Ent. Soc. Proc. 36: 142, pl. 19, fig. 1, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 494, figs. 1–2, pl. 65, fig. 9, 1934; O Campo 8 (90): 34, 1937.

(*Trypeta*) *Acrotoxa serpentina* (Wiedemann): Loew, Smithsn. Inst. Misc. Collect. 11 (256): 226, 227, pl. 11, fig. 22, 1873.

Medium sized to rather large, dark brown, marked with pale yellow and orange brown. Mesonotum 3.3–4.0 mm. long. Dorsum of thorax dark brown, with yellow markings as follows: A narrow median stripe, widening posteriorly to include acrostichal bristles but not reaching scutellum; humerus; a band

in front of and narrowly behind transverse suture; a stripe from juncture of transverse suture and notopleuron nearly to lateral margin of scutellum; and posterior two-thirds of scutellum, the dark basal area with convex hind margin. On disk of thorax, from a short distance behind anterior margin to short distance behind transverse suture, an orange-brown rectangle, densely clothed with pale-yellow pile. Propleuron and prosternum yellowish orange; mesopleuron dark brown, with narrow dorsal portion, widening to wing base, bright yellow; sternopleuron dark brown, with yellow stripe above and orange stripe below; metapleuron predominantly yellow, narrowly dark brown ventrally; metanotum orange brown to dark brown, usually with a paler median stripe. Macrochaetae black; pile orange brown on dark areas, pale yellow elsewhere. Sternopleural bristle very slender or evanescent. Wing 7.25-8.5 mm. long, the bands predominantly dark brown; costal and S bands rather broadly coalescent, the hyaline areas to each side of the juncture rarely touching vein R_{4+5} ; no distal arm to V band, the proximal arm slender, completely separated from S band. Dorsum of abdomen dark brown, the first tergite, a broad apical band on the second not reaching lateral margins, and a broad median stripe on tergites 3-4 usually yellow; tergite 5 mostly orange; sometimes the yellow pattern considerably reduced. *Female terminalia*: Ovipositor sheath 3.0-3.9 mm. long, orange brown, rather stout basally and depressed apically, the spiracles about 1.2 mm. from base. Rasper of closely set hooks in four or five rows. Ovipositor 2.8-3.7 mm. long, rather stout, widened at base and at end of oviduct, the tip with somewhat more than apical half minutely serrate. *Male terminalia*: Tergal ratio about 0.93; clasper stout basally, abruptly flattened beyond teeth, tapering to an acute apex; teeth about at middle.

Type material.—Holotype of *serpentina*, female (Vienna Museum); holotype of *vittithorax*, female (Bigot Collection).

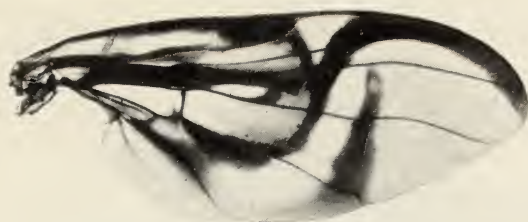
Type localities.—Of *serpentina*, Brazil; of *vittithorax*, "l'Indie."

Distribution.—Rio Grande Valley in Texas to Peru, Trinidad, and Brazil. The species has been trapped in considerable numbers in the Rio Grande Valley and has been reared from quince at Ramos Arispe, Coahuila, Mexico. It is found in abundance throughout Central America and occurs in Brazil to São Paulo. The species apparently has not become established in the West Indies, although there are specimens in the National Museum which came from pupae in sapodilla from Dominica.

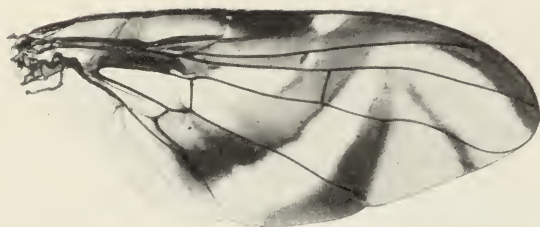
Food plants.—*Chrysophyllum cainito*, *C. panamense*, *Achras zapota*, *Calocarpum mammosum*, *Mimusops coriacea*, *Mammea americana*, *Zschokkea panamensis*, *Citrus sinensis*, *Dovyalis hebecarpa*, and *Cydonia oblonga*. It has also been reared experimentally in *Annona glabra* L., *Lycopersicon esculentum* Mill., *Mangifera indica*, and *Spondias mombin*. The preferred food plants are members of the family Sapotaceae, particularly *Chrysophyllum cainito* and *Achras zapota*. The record published by Greene (5, p. 143) of guava (*Psidium guajava*) as a food plant is, in the opinion of Zetek, undoubtedly an error, since in all of his work in the Canal Zone he has never found *serpentina* in the many guavas he has collected and he has never been able to get *serpentina* to develop in this fruit.

A specimen in the United States National Museum bears the following seven labels: "69; Brasilia Coll. Winthem; *Dacus serpentinus* Wied.; Type: this specimen is one of the original 3 types of Wiedemann; from Vienna Museum in exchange 1935 C. T. G.; Cotype No. 51251, U. S. N. M." This specimen is a male, and Wiedemann, in his original description, describes only the female. For this reason it is probable that this specimen should be considered as no more than a metatype.

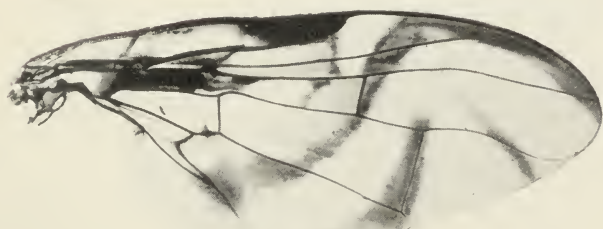
This species, the type of the genus, is one of a group of four species that differ rather strikingly in color pattern from the other species



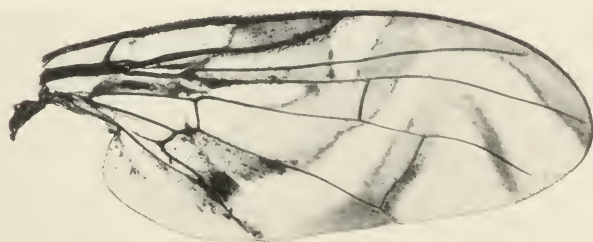
A



B



C



D

Wing of (A) *Anastrepha anomala*, (B) *A. striata*, (C) *A. bistrigata*, and (D) *A. pallidipennis*.



in the genus. Of the other three, *ornata* has the costal and \vee bands separated; *pulchra*, new species, has a large black spot in the disk of the wing; and *anomala*, new species, has the wing pattern as in *serpentina*, but has a longer ovipositor and a reduced dark pattern on the pleura and abdomen.

ANASTREPHA ANOMALA, new species

(Fig. 2, *D*; pl. 3, *A*)

Medium sized, predominantly yellow brown. Mesonotum 3.0–3.9 mm. long. Humerus, median stripe widening on scutum posteriorly, border of transverse suture, lateral stripe from transverse suture to scutellum, and scutellum pale yellowish; a brownish-black, sublateral stripe, wider behind transverse suture; a median, transverse, dark spot on scutoscuteellar suture; pleura pale yellow and yellow brown, a darker brown spot on pteropleuron and hypopleuron infuscated; occasionally brownish on lower portion of mesopleuron; metanotum dark brown, a median stripe, narrowed posteriorly, yellow brown. Sternopleural bristle weak. Wing 6.7–8.5 mm. long, the bands mostly dark brown; costal and *S* bands broadly joined along vein R_{4+5} ; distal arm of \vee band absent and proximal arm separated from *S* band. Abdominal tergites 2–3 or 2–4 each with a narrow, brownish, transverse band, narrowed and paler medianly. *Female terminalia*: Ovipositor sheath 4.2–4.6 mm. long, tapering apically, the spiracles about 1.25 mm. from base. Rasper well developed, the hooks in five or six rows. Ovipositor 3.9–4.6 mm. long, the tip smooth or with a few minute lateral serrations on apical third; shaft parallel sided, slightly widened at base. *Male terminalia*: Tergal ratio about 0.83; clasper about 0.43 mm. long, the teeth about at middle, and a strong lateral protuberance at level of teeth; basal half of clasper stout, apical half much flattened and tapering evenly to an acute apex.

Type material.—Holotype female (United States National Museum No. 51655); paratypes, 6 females, 9 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—Barro Colorado Island, Canal Zone, Panama.

Distribution.—Panama.

Food plant.—*Zschokkea panamensis*.

The holotype and ten paratypes were reared from the seeds of the food plant at the type locality, March 17–23, 1937, and January 1939 by James Zetek. The other paratypes, four females and one male, were trapped at El Cerrmeño, Panama, June 20, June 29, and October 10, 1939. These latter differ from the reared series in having the mesopleuron partially brownish and the ovipositor slightly shorter and stouter, with no serrations.

This species is close to *serpentina*, which has also been reared from the seed as well as the flesh of *Zschokkea panamensis* but differs in having much less black on the body and in having a longer ovipositor.

ANASTREPHA STRIATA SCHINER

(Fig. 3, *A*; pl. 3, *B*)

Anastrepha striata Schiner, Reise der Novara, Diptera, v. 2, p. 264, 1868; Bezzi, Portici R. Scuola Super. di Agr. Lab. Zool. Gen. e Agr. Bol. 3: 283, 285, 1909; Hendel, [Dresden] K. Zool. u. Anthrop.-Ethn. Mus. Abhandl. u. Ber. 14 (3): 19, pl. 1, fig. 7, 1914; Keilin and Picado, Bul. Sci. de la France et Belg. 48: 423–441, figs. 1–6, 1915; Picado, Colegio de Señoritas Pub., Ser. A, No. 2, 10–15, figs., 1920; Greene, Jour. Agr. Res. 38: 497, figs. 2, *D*, 3, *I*, 5, *D*, 6, *I*, 1929; Dampf, Irrig. en Mex. 7: 260–262, figs. 1, 5, 12, 1933; Emmart, Wash. Ent. Soc. Proc. 35: 184–191, pls. 7–8,

1933; McPhail and Bliss, U. S. Dept. Agr. Cir. 255: 2-6, 1933; Greene, Wash. Ent. Soc. Proc. 36: 145, pl. 19, fig. 8, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 504, figs. 7-8, pl. 65, fig. 11, pl. 76, fig. 70, 1934.

Rather small to medium sized; yellow brown, the thorax patterned with black. Mesonotum 2.45-3.57 mm. long, yellow brown, the humerus, median stripe expanding posteriorly, but not attaining scutellum, and most of scutellum pale yellow; a sublateral triangular spot anterior to transverse suture, its apex anterior, a sublateral stripe from transverse suture posteriorly and joining that of other side anterior to scutellum, base of scutellum narrowly, and another spot from behind wing base to lateral margin of scutellum of varying shades of brown to nearly black; on dark areas of scutum, before and behind transverse suture, dense patches of short, brownish-black setae; laterad of these, on the dark area, and toward the middle on the yellow-brown areas is pile, which is hoary when viewed from the front; lateral half of brown stripe from transverse suture to scutellum denuded; upper margin of pleura pale yellow; metanotum brownish black laterally, darkest anteriorly, usually orange

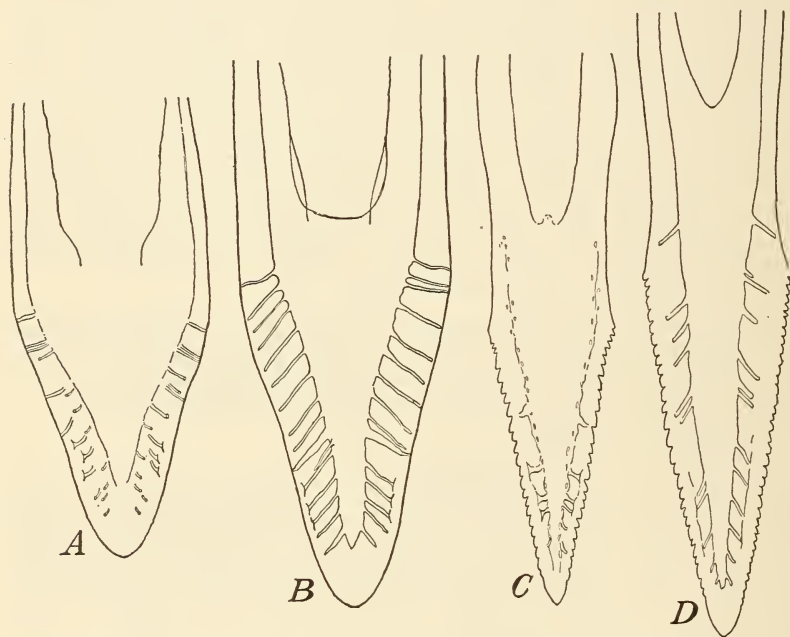


FIGURE 3.—Ovipositor tip of (A) *Anastrepha striata*, (B) *A. bistrigata*, (C) *A. pallidipennis*, and (D) *A. curitis*.

brown medianly. Macrochaetae nearly black; pile of abdomen dark brownish, of legs yellow. Sternopleural bristle well developed. Wing 5.9-7.7 mm. long, the bands yellow brown; costal and S bands touching on vein R_{4+5} and usually again just anterior to vein R_{2+3} , leaving a small hyaline spot in cell R_3 ; V band complete, separated from S band, the outer arm narrow. *Female terminalia*: Ovipositor sheath 2.6-2.9 mm. long, stout, tapering posteriorly, the spiracles 1.05 mm. from base. Rasper well developed, the hooks elongate, slender, in four or five rows. Ovipositor 2.0-2.15 mm. long, stout, the tip broad and blunt without distinct serrations; shaft slightly broadened at base. *Male terminalia*: Tergal ratio about 1.19; claspers about 0.44 mm. long, flattened, the posterior surface with a distinct carina from near base to apex of teeth; lateral margin beyond teeth convex, carinate; extreme apex narrow, abruptly turned posteriorly; teeth about at middle.

Type material.—Holotype female (Vienna Museum).

Type locality.—South America.

Distribution.—Mexico south from Tamaulipas and Sinaloa, Honduras, Costa Rica, Panama, Colombia, Ecuador, Bolivia, Venezuela, Trinidad, Tobago, and Surinam. Costa Lima (1934) reported a single male from Manaos, Amazonas, Brazil, and also mentions Peru and British Guiana. Four specimens have been trapped in the lower Rio Grande Valley of Texas, probably originating from infested fruit brought into the area.

Food plants.—*Psidium guajava*, *Calyptanthus tonduzii*, *Mangifera indica*, *Spondias* sp., near *lutea*, and one infestation in seed pods of *Manihot esculenta*. Baker has found the larvae in a fruit of the genus *Psidium*, locally known as arrayan, in the markets at Tuxpan and Tepic in the State of Tepic, Mexico. Zetek has also reared specimens from *Eugenia uniflora* and *Achras zapota* following laboratory infestation. Guava is the preferred food plant of the species.

The only species with thoracic pattern and wing pattern resembling this species is *bistrigata*. This is one of the commonest species of the genus.

ANASTREPHA BISTRIGATA Bezzi

(Fig. 3, B; pl. 3, C)

Anastrepha bistrigata Bezzi, Portici R. Scuola Super. di Agr. Lab. Zool. Gen. e Agr. Bol. 13: 4, 7-10, fig. 1, 1919; Chacaras e Quintaes 19: 373, fig. 1, 1919; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 505, figs. 9-10, pl. 65, fig. 12, pl. 75, fig. 63, 1934.

Medium sized, yellow brown, the thorax patterned with black. Mesonotum 3.4 mm. long, yellow brown, the humerus, median stripe widening posteriorly but not attaining scutellum, lateral stripe from just before transverse suture not attaining scutellum, and scutellum except narrowly anteriorly pale yellow; a pair of sublateral, blackish-brown stripes from behind humerus of each side to scutellum, nearly broken at transverse suture and joined posteriorly by a similarly colored band before, and narrowly behind, scutoscutellar suture; a dark-brown spot before lateral margin of scutellum; longitudinal stripes darkest medially; pleura yellow brown, with a paler stripe below notopleuron; metanotum black except narrowly medially. Macrochaetae black; scutum, except on darkest areas, with hoary pile when viewed from front, mixed with yellowish-brown pile; blackened areas with dark-brown pile, including lateral portions of sublateral stripes behind transverse suture. Sternopleural bristle slender, distinct. Wing 7.9 mm. long, the bands yellow brown; costal and S bands narrowly joined along vein R_{4+5} ; V band faded above, not joining S band. *Female terminalia*: Ovipositor sheath 3.9 mm. long, tapering apically, the spiracles 1.4 mm. from base. Rasper well developed, the hooks in five or six rows. Ovipositor 3.65 mm. long, the tip blunt, without serrations, the shaft distinctly widened at base. *Male terminalia*: Clasper about 0.35 mm. long, stout, the outer margin convex; teeth about at middle.

Type material.—Cotypes, two females, one male (Bezzi Collection, Milan).

Type locality.—State of São Paulo, Brazil.

Distribution.—Southern Brazil.

Food plants.—*Psidium guineense* and *P. guajava*.

This description is based upon two females from São Paulo and Belo Horizonte, and upon the figure of the male terminalia given by Costa Lima.

This species is closely related to *striata*, as is evident from the thoracic pattern and ovipositor, but differs in the characters men-

tioned in the key. In addition, the macrochaetae of the fore femur are distinctly darker and shorter than in *striata*.

ANASTREPHA PALLIDIPENNIS Greene

(Fig. 3, C; pl. 3, D)

Anastrepha pallidipennis Greene, Wash. Ent. Soc. Proc. 36: 166, pl. 23, fig. 1, 1934.

Medium sized to rather large, yellow brown. Clypeal ridge convex in profile, usually rather strongly so. Mesonotum 3.1–4.5 mm. long, yellow brown, with the following pale-yellow markings: A rather wide median stripe, widening posteriorly to include acrostichal bristles; a narrow stripe covering humerus, and bordering lateral margin to scutellum, with an extension mediad bordering transverse suture; and scutellum. Pleura largely pale yellow; metanotum entirely yellow orange. Macrochaetae black; pile yellow. Sternopleural bristle very weak or absent. Wing 7.9–10.0 mm. long, the bands pale yellowish brown; costal and S bands joined for a short distance along vein R_{4+5} ; V band complete, separate, or very narrowly joined to S band. *Female terminalia*: Ovipositor sheath 6.54–11.2 mm, long, slender, the extreme base abruptly swollen, with the spiracles about 0.45 mm. from base. Rasper of rather long, only slightly curved hooks, set rather far apart in four or five irregular rows. Ovipositor 5.77–8.3 mm. long, slender, the extreme base scarcely broadened, the tip with apical two-thirds minutely serrate, tapering to an acute apex; a distinct angle at base of serrate portion. *Male terminalia*: Tergal ratio about 1.0; clasper about 0.3 mm. long, stout, only the extreme apex somewhat flattened; teeth subapical, small portion beyond teeth coming to a rather broad apical angle, and outer margin of clasper distinctly angulate at level of teeth.

Type material.—Holotype female (United States National Museum).

Type locality.—Medellin, Colombia.

Distribution.—Colombia and Panama.

Food plants.—*Passiflora quadrangularis*, *P. ambigua*, and *P. seemanni*.

This species as here interpreted shows a rather wide variation in the length of the ovipositor sheath, but the other characters are so uniform that this is probably of no significance. The type specimen, which was reared from *Passiflora quadrangularis*, according to a letter from C. H. Ballou, the collector, is the smallest one seen. A series from *P. seemanni* show the longest ovipositors. Other specimens from *P. ambigua* and *P. quadrangularis* are intermediate. The species has been reared in considerable numbers from the food plants on Barro Colorado Island, Canal Zone, Panama, by James Zetek.

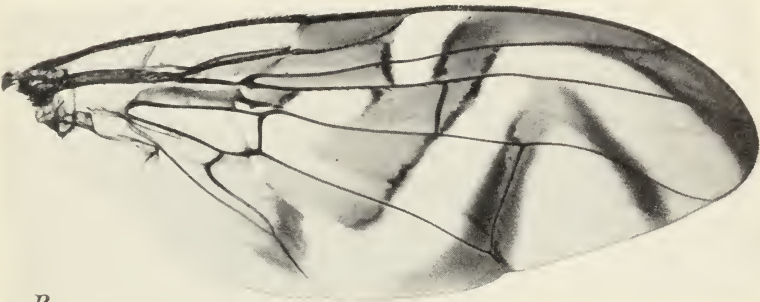
ANASTREPHA CURITIS, new species

(Fig. 3, D; pl. 4, A)

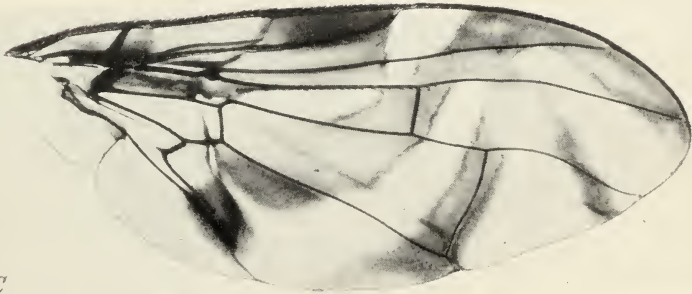
Large, yellow brown. Clypeal ridge distinctly swollen medianly. Mesonotum 4.5 mm. long; no paler stripes evident, but specimen dirty; metanotum not darkened laterally. Macrochaetae black; pile light yellow brown. Sternopleural bristle weak, pale. Wing 10.9 mm. long, the bands yellow brown; costal and S bands rather broadly connected along vein R_{4+5} ; V band complete, not joined to S band. *Female terminalia*: Ovipositor sheath 8.75 mm. long, slender, the base somewhat swollen and spiracles about 1.2 mm. from extreme base. Rasper well developed, the hooks in five or six rows, not closely appressed. Ovipositor about 8 mm. long, slender, the tip elongate with many fine serrations on apical two-thirds; a slight constriction just basad of serrations; shaft slightly widened at extreme base.



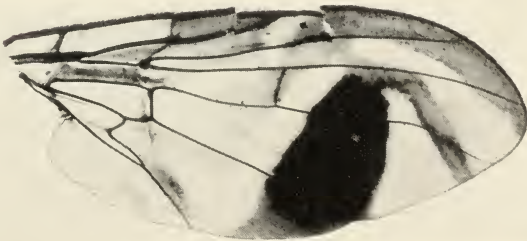
A



B



C



D

Wing of (A) *Anastrepha curitis*, (B) *A. superflua*, (C) *A. benjamini*, and (D) *A. cordata*.



Type material.—Holotype female (British Museum).

Type locality.—Para, Brazil.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

This species resembles *pallidipennis* in its swollen clypeal ridge and in the shape of the ovipositor, but the spiracles of the ovipositor sheath are more than twice as far from the base in *curitis*.

ANASTREPHA SUPERFLUA, new species

(Fig. 4, A; pl. 4, B)

Rather large to large, yellow brown. Clypeal ridge with a moderate to very strong median protuberance, bearing an orange-brown, median, longitudinal groove. Mesonotum 3.8–4.7 mm. long, orange brown, with a slender median stripe widening abruptly at posterior third to include dorsocentral and acrostichal bristles but not reaching scutellum, humerus, notopleuron, a sublateral stripe from transverse suture to scutellum, and scutellum pale yellow; pleura mostly yellow brown; metanotum entirely yellow orange. Macrochaetae yellow brown to nearly black; pile yellow. Sternopleural bristle strong. Wing 8.6–11 mm. long, the bands yellow orange; costal and S bands joined for a short distance along vein R_{4+5} ; V band complete, separated from S band; vein M_{1+2} turned forward very little at wing margin. *Female terminalia*: Ovipositor sheath 9.25–12.5 mm. long, slender, the spiracles about 1.9 mm. from base. Rasper of rather long hooks in five or six rows. Ovipositor 9–11.5 mm. long, slender, the base slightly widened, the tip extending with nearly uniform width for some distance beyond end of oviduct and then abruptly narrowed to serrate portion, tapering to apex. *Male terminalia*: Tergal ratio about 1.45; clasper about 0.3 mm. long, stout basally, narrowed and somewhat flattened apically, the apical portion curved posteromedially; tip blunt; teeth slightly distad of middle.

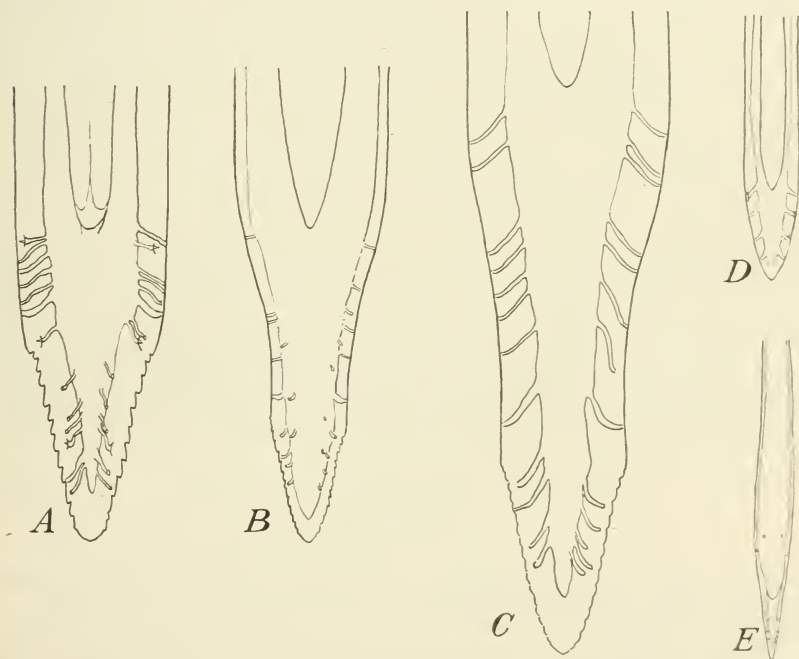


FIGURE 4.—Ovipositor tip of (A) *Anastrepha superflua*, (B) *A. benjamini*, (C) *A. discesa* (from photo, the scale 1.286 that of others), (D) *A. cordata*, and (E) *A. punctata*.

Type material.—Holotype female (United States National Museum No. 51656); paratypes, 12 females, 7 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—El Cermeño, Panama.

Distribution.—Panama.

Food plant.—Unknown.

The holotype was trapped June 20, 1939, by James Zetek. The other paratypes were trapped at El Cermeño and La Campana, Panama, and at Balboa, Canal Zone, from May 30 to July 20.

The species is related to *benjamini* and *discessa*, new species, but the ovipositor tip is quite different, as indicated in the key and by the figures.

ANASTREPHA BENJAMINI Costa Lima

(Fig. 4, B; pl. 4, C)

Anastrepha benjamini Costa Lima, O Campo 9 (98): 16, figs. 2, 6-9, 1938.

Rather large, yellow brown. Clypeal ridge rather strongly protuberant, with a narrow median depression. Mesonotum 3.8-4.0 mm. long, orange brown, the humerus, lateral stripe from transverse suture to scutellum, and scutellum paler, but no median stripe evident; pleura yellow brown, the mesopleuron just below notopleuron yellow; metanotum entirely orange brown. Macrochaetae black; pile yellowish brown. No sternopleural bristle. Wing 8.6-9.25 mm. long, the bands orange brown; costal and S bands touching on vein R_{4+5} ; V band complete and rather broadly joined to S band above. *Female terminalia*: Ovipositor sheath 8.6 mm. long, the basal half gradually tapering, the spiracles nearly 2.0 mm. from base. Rasper of many hooks in five or six rows. Ovipositor 8.75 mm. long, the extreme base scarcely widened, the tip tapering rather abruptly, the apical two-fifths serrate. *Male terminalia*: Tergal ratio about 1.33; clasper about 0.4 mm. long, stout basally, flattened apically, the inner margin beyond teeth nearly straight, the outer margin weakly convex to a short distance beyond teeth and then rather abruptly tapering to an acute apex; teeth about in middle.

Type material.—Holotype female, allotype, and paratypes (Instituto Oswaldo Cruz).

Type locality.—Agua Preta, Bahia, Brazil.

Distribution.—Bahia, Brazil.

Food plant.—Guaieba branca.

This description is based upon a female determined by Dr. Costa Lima from Bahia (Bondar No. 2175) and a male of the same rearing as the type series. The swollen clypeal ridge, the shape of the ovipositor sheath, and the position of the spiracles on the sheath distinguish this species from all but the closely related new species *superflua* and *discessa*. Both these differ from *benjamini* in the shape of the ovipositor tip, as indicated in the key.

ANASTREPHA DISCESSA, new species

(Fig. 4, C)

Anastrepha connexa Costa Lima (not Costa Lima), O Campo 9 (95): 61, fig. 18, pl. 5, fig. 1, pl. 6, fig. 4, 1938.

Anastrepha (?) *connexa* Costa Lima (not Costa Lima), O Campo 9 (98): 16, figs. 3, 5, 8, 1938.

Apparently agreeing with *benjamini* Costa Lima in every respect save in the wing pattern and ovipositor tip, as indicated in the key and figures.

Type material.—Holotype female (Instituto Oswaldo Cruz No. 3033).

Type locality.—Campo Grande, Distrito Federal, Brazil.

Distribution.—Known from the type locality only.

Food plant.—Unknown.

The writer has not seen this species, but a study of the original photographs, submitted by Dr. Costa Lima, convinces him that the species is neither *connexa* nor *benjamini*. The figure of the ovipositor reproduced here is drawn from the photograph and represents a magnification of about 1.29 times that of the other drawings. The specimen was determined by Dr. Costa Lima as the female of his *connexa*. Later he questioned his determination, having discovered another closely related female which he named *benjamini*. These two species, *discessa* and *benjamini*, are very close, but they appear to be distinct. *Anastrepha connexa* is quite different from these in that it lacks the swollen clypeal ridge, and that, judging from the length of the aedeagus, the ovipositor is considerably shorter.

ANASTREPHA CORDATA Aldrich

(Fig. 4, *D*; pl. 4, *D*)

Anastrepha cordata Aldrich, U. S. Natl. Mus. Proc. 66 (18): 4, 1926; Greene, Wash. Ent. Soc. Proc. 36: 144, pl. 19, fig. 6, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 502, 1934.

Medium sized, yellow brown, marked with darker brown. Mesonotum 3 mm. long. Mesoscutum with dark-brown markings as follows: A pair of submedian stripes, slightly divergent on anterior two-thirds, the posterior ends rounded; a triangular spot before transverse suture; a sublateral stripe from just behind transverse suture to posterior margin on each side, narrowly separated from submedian stripes; a transverse band before scutellum, extending downward to wing base but not bordering lateral margin of scutellum. Postscutellum laterally and metanotum brownish black. Macrochaetae nearly black; pile orange brown. Sternopleural bristle slender or absent. Wing 7.6 mm. long; bands yellow brown except for the greatly broadened, dark-brown proximal arm of V band; costal and S bands touching on vein R_{4+5} , the hyaline costal triangle sometimes obliterated; V band joined to S band anteriorly; vein M_{1+2} turned forward apically less than usual. Abdomen with dark basal bands on tergites 2-5, widened laterally and becoming successively narrower posteriorly. *Female terminalia*: Ovipositor sheath 5.2-6.1 mm. long, cylindrical, tapering, the spiracles about 1.1 mm. from base. Rasper well developed, the hooks in four or five rows. Ovipositor 4.9-5.5 mm. long, slender, the tip short, without serrations. *Male terminalia*: Tergal ratio about 0.9; clasper about 0.15 mm. long, very stout, the anterior surface strongly convex, the posterior surface concave, and the median surface beyond the teeth concave and rimmed by a hirsute carina; teeth about at middle.

Type material.—Holotype female (United States National Museum).

Type locality.—British Honduras.

Distribution.—British Honduras and Panama.

Food plant.—Unknown.

Three males and two females have been trapped by James Zetek at La Campana and El Cermeño, Panama, in October, November, December, and June. The male is here described for the first time. These Panama specimens have the costal hyaline spot nearly or quite obliterated. In the holotype this spot is weakly colored in one wing.

The wing pattern of this species is strikingly different from that of any other known species. The thoracic and abdominal pattern is very similar to that found in the genus *Pseudodacus*, but the rasper is not of the *Pseudodacus* type, nor is the ovipositor so slender or the aedeagus so short.

ANASTREPHA PUNCTATA Hendel

(Fig. 4, E; pl. 5, A)

Anastrepha punctata Hendel, [Dresden] K. Zool. u. Anthropol.-Ethnogr. Mus. Abhandl. u. Ber. 14 (3): 14 and 19, 1914; Fischer, Rev. de Ent. 3: 84-86, fig. 1, 1933; Greene, Wash. Ent. Soc. Proc. 36: 155, pl. 20, fig. 12, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 508, pl. 66, fig. 16, 1934; Blanchard, Soc. Ent. Argentina Rev. 9: 41, 1937.

Anastrepha hendeli Greene, Wash. Ent. Soc. Proc. 36: 155, pl. 21, fig. 1, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 603, 1934. (New synonymy.)

Anastrepha minor Costa Lima, Inst. Oswaldo Cruz Mem. 28: 509, fig. 14, pl. 66, fig. 17, and p. 603, 1934. (New synonymy.)

Small to rather small, predominantly orange yellow. Mesonotum 2.4-2.9 mm. long, orange yellow, with a brownish-black spot on scutum at each angle of scutellum, and pale-yellow markings as follows: A narrow median stripe widening to include acrostichal bristles; humerus and a stripe posterior to the anterior intraalar bristle; a stripe from transverse suture to lateral margin of scutellum just laterad of black spot; scutellum. Pleura orange yellow, with pale-yellow markings. Metanotum entirely orange yellow. Macrochaetae orange yellow; pile pale yellow. Sternopleural bristle strong. Wing 5.6-6.5 mm. long, the pattern orange yellow; costal and S bands separated; V band separated from S band and broken or the connection very indistinct anteriorly; apex of vein M_{1+2} turned forward only very slightly. Abdomen orange brown, often with a round, brownish-black spot on each side of tergites 3-4 and occasionally faintly indicated on tergite 5. *Female terminalia*: Ovipositor sheath 1.8-1.9 mm. long, rather stout basally, tapering posteriorly, the spiracles about 0.55 mm. from base. Rasper of four well developed, curved teeth, and several smaller ones. Ovipositor 1.55 mm. long, slender, the shaft about 0.028 mm. wide, the base abruptly widened, the tip short, without serrations. *Male terminalia*: Tergal ratio about 0.62; clasper minute, stout basally, the apical portion compressed and curved posteriorly to form a short, flattened, blunt hook, with the teeth on the inner surface just basad of the bend.

Type material.—Of *punctata*, cotypes, male and female (Hungarian National Museum); of *hendeli*, female (United States National Museum); of *minor*, male (Secção de Entomologia Agrícola do Instituto de Biologia Vegetal).

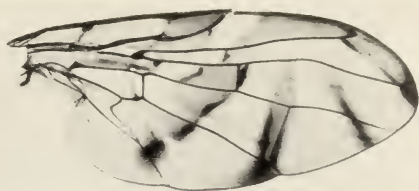
Type localities.—Of *punctata*, S. Bernardino, Paraguay; of *hendeli*, São Paulo, Brazil; of *minor*, Fazenda, Murtinho, Matto Grosso, Brazil.

Distribution.—Southern Brazil, Paraguay, and northern Argentina.

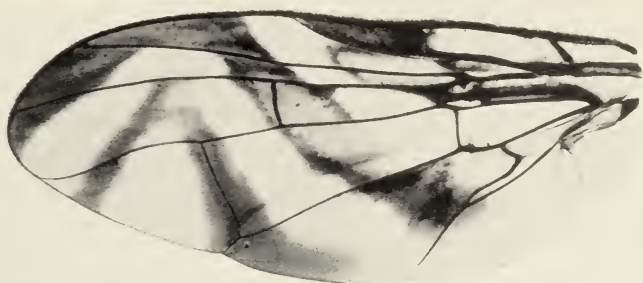
Food plant.—*Psidium guajava* (teste Blanchard).

Greene based *hendeli* and Costa Lima based *minor* upon specimens lacking the dark spots on the abdomen. Later Costa Lima placed his *minor* as a probable synonym of *hendeli*. An examination of the type series of *hendeli* shows the holotype to have a spot on one side of tergite 3 and one of the paratypes to have all four spots faintly. Since no characters can be found in the terminalia of either sex to differentiate the two, or any difference in wing pattern, it does not seem possible to consider them as different species.

This species has several characters similar to those found in the genus *Pseudodacus*. The rasper is reduced to a few hooks, but here



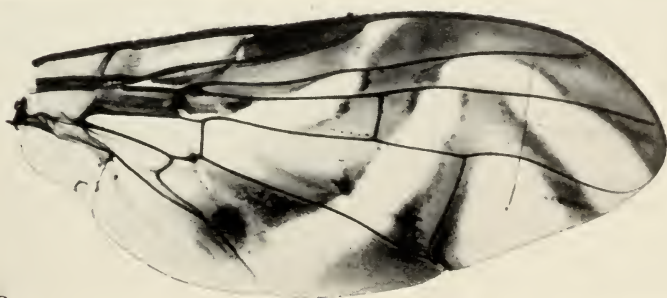
A



B



C



D

Wing of (A) *Anastrepha punctata*, (B) *A. schausi*, (C) *A. tripunctata*, and (D) *A. convoluta*.



they are not so stout as in *Pseudodacus* nor do they point laterally, and the ovipositor is very slender, but it is much shorter than in *Pseudodacus*. It differs markedly, however, from *Pseudodacus* in the wing pattern and in having the aedeagus elongate.

ANASTREPHA SCHAUSI Aldrich

(Pl. 5, B)

Anastrepha schausi Aldrich, U. S. Natl. Mus. Proc. 66 (18) : 3, 1926; Greene, Wash. Ent. Soc. Proc. 36 : 168, pl. 23, fig. 9, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28 : 514, 1934; O Campo 8 (90) : 37, 1937.

Rather large, predominantly orange brown. Third antennal segment rather stout, the apex somewhat darkened. A narrow, dark line along clypeal margin of mouth; lateral margins of mouth considerably widened, shiny, with a dark-brown stripe bordered by pale yellow. Mesonotum 3.75 mm. long, orange brown, with median and lateral stripes, humerus, and scutellum pale yellow. Metanotum orange brown. Macrochaetae black; pile orange brown, paler on yellow areas of mesoscutum. Sternopleural bristle well developed. Wing 8.6 mm. long, the bands orange brown; costal, S, and V bands all separated. *Male terminalia*: Tergal ratio slightly more than 1.0; clasper about 0.35 mm. long, rather stout basally, somewhat flattened apically, the apex acute; teeth slightly distad of middle.

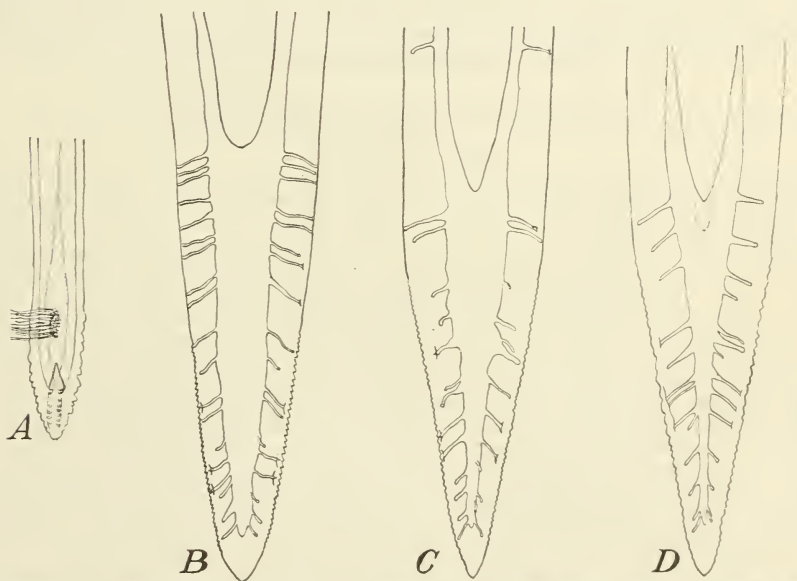


FIGURE 5.—Ovipositor tip of (A) *Anastrepha convoluta*, (B) *A. leptozona*, (C) *A. dissimilis*, and (D) *A. chiclayae*.

Type material.—Holotype male (United States National Museum).

Type locality.—Juan Vinas, Costa Rica.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

This species may be readily recognized by the structure and color of the oral margin. The structure of the male terminalia suggests that the ovipositor of the female is elongate.

ANASTREPHA TRIPUNCTATA Van der Wulp

(Pl. 5, C)

Anastrepha tripunctata Van der Wulp, Biologia Centrali-Americana, Insecta, Diptera, v. 2, p. 405, pl. 11, fig. 22, 1899; Bezzi, Portici R. Scuola Super. di Agr. Lab. Zool. Gen. e Agr. Bol. 3: 286, 1909; Hendel, [Dresden] K. Zool. u. Anthropol.-Ethnogr. Mus. Abhandl. u. Ber. 14 (3): 14, 1914; Greene, Wash. Ent. Soc. Proc. 36: 158, pl. 21, fig. 4, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 513, 1934.

Small, yellow brown. Apex of scutellum with a pronounced, rather irregular, black spot; a small black spot on each side of postscutellum. Macrochaetae black; pile yellow brown. Wing 5.4 mm. long, all bands connected, but the connection of the costal and S bands along vein R_{2+3} and these bands separated along vein R_{4+5} ; a distinct hyaline spot at apex of vein R_{2+3} ; a smaller one at apex of vein R_{4+5} . *Female terminalia*: Ovipositor sheath 1.26 mm. long. Rasper of well developed hooks. Ovipositor tip rather stout, the extreme apex slightly curved upward.

Type material.—Cotypes, male and female (British Museum).

Type locality.—Venta de Zopilote, Guerrero, Mexico.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

The foregoing description is based upon the original one and figures and notes supplied by Dr. Smart from a study of the types. The black spot at the apex of the scutellum is found in no other known *Anastrepha* and the wing pattern is also rather distinctive.

ANASTREPHA CONVOLUTA, new species

(Fig. 5, A; pl. 5, D)

Anastrepha integra Greene, part (not Loew), Wash. Ent. Soc. Proc. 36: 168, pl. 23, fig. 4, 1934.

Medium sized to rather large, yellow brown. Mesonotum 3.4–4.0 mm. long. Thorax almost uniformly yellow brown. Macrochaetae black or nearly so; pile yellow. Sternopleural bristle usually present, weak. Wing 7.6–9.0 mm. long; costal band either completely separated from S band or connected along anterior margin of vein R_{2+3} ; V band usually widely separated from S band. *Female terminalia*: Ovipositor sheath 4.2–4.5 mm. long, the basal half decidedly swollen, the apical half slender, parallel-sided; spiracles about 1.0 mm. from base. Rasper consisting of well developed hooks in two or three rows. Ovipositor much longer than ovipositor sheath, the basal portion coiled in swollen sheath, the straight, apical portion about 2.0 mm. long; tip short, slender, minutely serrate as in figure 5, A; extreme base of ovipositor broadened. *Male terminalia*: Tergal ratio about 1.0; clasper about 0.22 mm. long, stout, the apical portion only slightly flattened, blunt at apex; teeth about at middle.

Type material.—Holotype female (United States National Museum No. 51657); paratypes, seven females, one male (British Museum, American Museum of Natural History, and collection of L. D. Cleare).

Type locality.—Verdant Vale, Arima, Trinidad.

Distribution.—Trinidad and British Guiana.

Food plant.—Unknown.

The holotype was collected in April 1912 by F. W. Ulrich. The paratype data are as follows: Mt. Harris, Trinidad, July 23–31, 1924 (C. L. Withycombe); British Guiana, 1908 (K. S. Wise) and April 14, 1913; Morabelli Creek, Essequibo River, British Guiana, August 21, 26, and October 19, 1929; Kartabo, Bartica District, British Guiana, 1912; Issororo, N. W. District, British Guiana, September 1917 (G. E.

Bodkin). The holotype and one of the paratypes bore the determination *integra* (Loew), an erroneous one, since the ovipositor sheath of *integra* is more than 9 mm. long. Two other paratypes were determined as *ethalea* (Walker), but the wing pattern of *ethalea* is different.

The remarkable ovipositor of this species will distinguish it in the female from all other known species. It is of interest to note that the aedeagus is of normal size and not lengthened to correspond to the full length of the ovipositor.

ANASTREPHA HAYWARDI Blanchard

Anastrepha haywardi Blanchard, Soc. Ent. Argentina Rev. 9: 39, fig. 3, 1937.

Medium sized, brownish yellow. Metanotum not darkened laterally. Macrochaetae yellow brown; pile yellow. No sternopleural bristle. Wing 8.0 mm. long; costal band narrowly separated from S band; V band lacking distal arm, the proximal arm narrowly joined to S band; vein M_{1+2} turned forward so that cell second M_2 reaches apex of S band. *Female terminalia*: Ovipositor sheath 2.0 mm. long, tapering to apex. Ovipositor tip evenly tapering to the rather blunt apex, with about nine rather blunt serrations, starting a short distance distad of the end of the oviduct.

Type material.—Cotypes, male and female (Collection of E. E. Blanchard).

Type locality.—Concordia, Provincia de Entre Rios, Argentina.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

This species has not been seen by the writer, the foregoing description being taken from the original one. The male terminalia have not been described. The species resembles *leptozonea* in the course of vein M_{1+2} and somewhat in the wing pattern, but the ovipositor sheath in *leptozonea* is longer and the serrations of the ovipositor tip are much more numerous.

ANASTREPHA LEPTOZONA Hendel

(Fig. 5, B; pl. 6, A)

Anastrepha leptozonea Hendel, [Dresden] K. Zool. u. Anthrop.-Ethnol. Mus. Abhandl. u. Ber. 14 (3): 19, 1914; Greene, Wash. Ent. Soc. Proc. 36: 153, pl. 20, fig. 10, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 515, figs. 17-18, pl. 67, fig. 20, pl. 75, fig. 66, 1934; O Campo 8 (90): 34, 1937.

Rather small to rather large, yellow orange. Mesonotum 3.25-4.2 mm. long, yellow orange, the humerus, a faintly indicated median stripe widening posteriorly, a lateral stripe from transverse suture to scutellum, and scutellum pale yellow; sometimes a slightly darkened band on hind margin of mesoscutum; pleura yellow orange, the mesopleuron narrowly above and the metapleuron pale yellow; metanotum yellow orange. Macrochaetae black; pile yellow. No sternopleural bristle. Wing 6.9-9.1 mm. long, the bands brown to yellow brown, all disconnected, the V band usually broken anteriorly and frequently the distal arm greatly reduced and confined to a small spot across vein M_{1+2} ; anal cell, at least apically, nearly or quite hyaline; vein M_{1+2} curved forward more than usual so that cell second M_2 reaches end of S band. *Female terminalia*: Ovipositor sheath 2.9-3.4 mm. long, rather stout, tapering posteriorly, the spiracles about 1.1 mm. from base. Rasper of well developed, curved hooks in three or four rows. Ovipositor 2.4-3.1 mm. long, the base widened, the tip tapering evenly from near end of oviduct, with many minute teeth on somewhat more than the apical half. *Male terminalia*: Tergal ratio about 0.75; clasper about 0.3 mm. long, stout, only the apical fourth flattened; lateral margin convex to near apex and then abruptly concave to a pronounced lateral projection; inner margin convex to the truncate apex; teeth subapical.

Type material.—Holotype male (Dresden Museum).

Type locality.—San Antonio, Mapiri, Bolivia.

Distribution.—From Guatemala through Central America to British Guiana, Bolivia, and southern Brazil.

Food plants.—*Lucuma caimito*, *Lucuma* sp. under the Brazilian vernacular name of bacumucha, pau macaco (Sapotaceae or perhaps *Lecythis* sp.), mapeba branca, and *Chrysophyllum cainito*.

This species has been trapped in considerable numbers in Panama and four specimens have been reared from *Chrysophyllum* by James Zetek. For those food plants in which only the Brazilian vernacular names are given we have been unable to obtain the Latin names.

This species is rather easily distinguished by the upturned vein M_{1+2} , the usually reduced distal arm of the V band, the nearly hyaline anal cell, and the character of the ovipositor. There is considerable variation in the size of the distal arm of the V band, which in a very few specimens is joined to the proximal arm anteriorly, in others nearly reaching it, and in others nearly absent.

ANASTREPHA CRUZI Costa Lima

Anastrepha cruzi Costa Lima, Inst. Oswaldo Cruz Mem. 28: 513, pl. 66, fig. 19, 1934.

Medium sized, yellow brown, the thorax marked with ivory colored markings, as follows: A pair of divergent, obovate spots in front of scutellum, their anterior apices nearly touching; a stripe from humerus to transverse suture; another from transverse suture to side of scutellum; another, below these, from humerus to wing base; a narrow stripe along suture between sternopleuron and mesopleuron and pteropleuron; scutellum; sides of metathorax; no median pale stripe on mesoscutum and no darkening of sides of metanotum. Macrochaetae yellow brown; sternopleural bristle rudimentary. Wing 8 mm. long, the bands yellow brown; costal and S bands barely touching; V band with proximal arm narrowly joined to S band, the distal arm short, extending anteriorly from hind margin of wing only to middle of cell R_5 . Abdomen lost.

Type material.—Holotype, sex unknown (Instituto Oswaldo Cruz).

Type locality.—Amazon River.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

This species was described from an old, incomplete specimen. The thoracic pattern is probably distinctive, but without examination the specimen cannot be placed in the key satisfactorily.

ANASTREPHA DISSIMILIS, new species

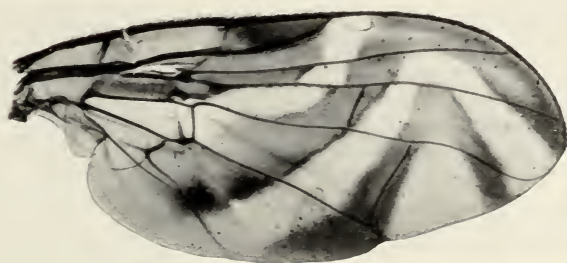
(Fig. 5, C; pl. 6, B)

Anastrepha similis Greene (not Greene, in part), Wash. Ent. Soc. Proc. 36: 153, 1934.

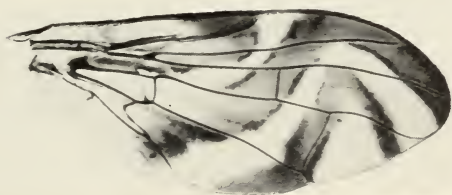
Rather small, yellow brown. Mesonotum 3.0-3.2 mm. long. Thorax almost uniformly yellow brown, the humerus, scutellum, and faintly indicated lateral stripes on scutum paler; one paratype with indistinct, dark median spot on scutoscutellar suture. Macrochaetae black or brownish black; pile yellow brown. Sternopleural bristle of holotype rather strong, of paratypes very weak. Wing 7.0-7.5 mm. long, the bands yellow brown; all bands complete, disconnected. *Female terminalia*: Ovipositor sheath 3.0-3.9 mm. long, tapering to somewhat beyond basal half; spiracles 0.88-1.15 mm. from base. Rasper of many long, slender hooks in six or seven rows. Ovipositor 2.9-3.4 mm. long, moderately stout, the tip long and slender, with many minute serrations; extreme base only slightly widened.



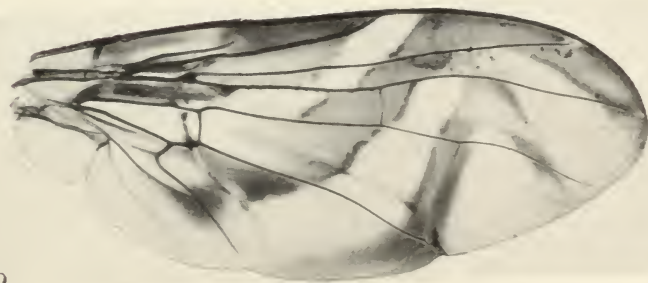
A



B



C



D

Wing of (A) *Anastrepha leptozona*, (B) *A. dissimilis*, (C) *A. chiclayae*, and (D) *A. elegans*.



Type material.—Holotype female (United States National Museum No. 51658); paratypes, two females (United States National Museum and American Museum of Natural History).

Type locality.—Near Plaisance, Haiti.

Distribution.—Haiti, British Guiana, and Pernambuco, Brazil.

Food plant.—Unknown.

The holotype was collected by Max Kisliuk and C. E. Cooley on "rose apple," July 5, 1931. One paratype from Bonito Province, Pernambuco, Brazil, is the paratype of *Anastrepha similis* Greene; the second was collected at Tumatumari, British Guiana, July 12, 1911.

The species may readily be separated from *similis* by the very differently shaped ovipositor. The three specimens determined as this species show considerable variation in the length of the ovipositor sheath and ovipositor, but the structure of the ovipositor tip and rasper and the wing pattern are the same in all three specimens. The ovipositor of the holotype is intermediate in length.

ANASTREPHA MUNDA Schiner

Anastrepha munda Schiner, Reise der Novara, Diptera, p. 264, 1868; Greene, Wash. Ent. Soc. Proc. 36: 169, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 2S: 521, pl. 63, fig. 5, 1934; O Campo 8 (90): 37, 1937.

According to the original description, this species agrees in every particular with *unicolor* Loew (a synonym of *fraterculus*) except that the mesoscutum is unicolorous, with no lighter or darker markings, the facial depression has a white sheen, and the palpus is somewhat widened anteriorly. The photograph of the type given by Costa Lima shows all the wing bands disconnected.

Type material.—Holotype male (Vienna Museum).

Type locality.—South America (Venezuela, as given on the type specimen).

Distribution.—Venezuela.

Food plant.—Unknown.

This species has not been certainly recognized, although there have been several attempts to place it. Bezzi (1, p. 283) considered it to be a synonym of *fraterculus*, but the absence of mesonotal markings and the nature of the wing pattern show this to be incorrect. Hendel (6, p. 18) and Fischer (4, p. 309) synonymized it with *obliqua*. Since *obliqua* remains unknown, this synonymy fails to identify it, but it is extremely unlikely that it is the same as *obliqua* as the latter was originally described. Since *munda* was described from a male, it will be difficult to establish its identity.

ANASTREPHA CHICLAYAE Greene

(Fig. 5, D; pl. 6, C)

Anastrepha chiclayae Greene, Wash. Ent. Soc. Proc. 36: 167, 1934.

Anastrepha chiclayae Costa Lima, O Campo 8 (90): 37, 1937. (Misspelling.)

Rather small to medium sized, yellow brown. Mesonotum 2.7–3.1 mm. long, yellow brown, the humerus, median stripe widening on scutum posteriorly, lateral stripe from transverse suture to scutellum, and scutellum paler yellow; pleura mostly pale yellow; metanotum uniformly yellow brown. Macrochaetae brown to brownish black; pile pale yellowish. Sternopleural bristle absent or very slender. Wing 6.6–7.6 mm. long, the bands orange yellow and brownish; costal and S bands separated (type) or narrowly joined at vein R_{4+5} ; V band

rather broad, separated from **S** band (type) or narrowly connected. *Female terminalia*: Ovipositor sheath 2.1–2.6 mm. long, moderately stout, the spiracles 0.78–0.85 mm. from base. Rasper of many slender hooks in five to seven rows. Ovipositor 2.0–2.35 mm. long, moderately stout, the extreme base slightly widened, the tip rather long, with many minute serrations. *Male terminalia*: Tergal ratio about 1.0; claspers about 0.32 mm. long, stout basally, the apical portion strongly flattened, somewhat narrowed to the blunt apex; teeth about at middle.

Type material.—Holotype female, allotype, and paratypes (United States National Museum).

Type locality.—Hacienda Ouefe, Chiclayo (given on labels and in original description as Chiclaya), Peru.

Distribution.—Rio Grande Valley in Texas; Tamaulipas and Morelos, Mexico; Panama; and Chiclayo, Peru.

Food plant.—Unknown.

The writer has seen additional specimens from the type locality as well as a number of specimens trapped at various places in the Rio Grande Valley in Texas, at Hacienda Santa Engracia, Tamaulipas, at Cuernavaca, Morelos, and four in Panama. Specimens from the northern part of the range tend to have the costal and **S** bands touching, and often have a weak sternopleural bristle. Both the original series and the topotype material contain specimens with the costal and **S** bands joined and others with these separated.

This species is close to several others, notably *borgmeieri*, in which the **V** band is not so heavy anteriorly and vein R_{2+3} is more strongly undulant; to *xanthochaeta*, in which the macrochaetae are paler and the ovipositor tip very different; and to *pseudoparallela*, in which the ovipositor is longer, with somewhat different dentition.

ANASTREPHA ELEGANS Blanchard

(Fig. 6, A; pl. 6, D)

Anastrepha elegans Blanchard, Soc. Ent. Argentina Rev. 9: 37, fig. 2, 1937.

Anastrepha parallela Greene (not Wiedemann), Wash. Ent. Soc. Proc. 36: 168, pl. 23, fig. 8, 1934.

Rather large, yellow brown. Palpus somewhat darkened apically. Mesonotum 3.6–3.8 mm. long. Thorax almost uniformly yellow brown, with no yellow stripes. Macrochaetae black; pile brown. Sternopleural bristle strong, subequal to pteropleural bristle. Wing 9.3–10.0 mm. long, the bands yellow brown; costal and **S** bands widely separated; **V** band complete, separated from **S** band. *Female terminalia*: Ovipositor sheath 3.2–3.39 mm. long, tapering, the spiracles about 1.0 mm. from base. Rasper of rather short hooks in five or six rows. Ovipositor 3.0 mm. long, rather stout, the tip rather broad, serrate, with a slight constriction just basad of serrate portion; base of shaft widened. *Male terminalia*: Tergal ratio about 1.0; clasper about 0.37 mm. long, stout basally, the apical portion flattened; outer margin nearly straight to near apex, then abruptly concave to the rather acute apex; inner margin slightly curved outward near apex; teeth about at middle.

Type material.—Cotype females (Collection of Everard E. Blanchard).

Type locality.—Jaguarete, Provincia de Corrientes, Argentina.

Distribution.—Argentina, Paraguay, and southern Brazil.

Food plant.—Unknown.

This description is based upon the original one and upon seven females and seven males collected at Nova Teutonia, Rio Grande do Sul, Brazil, January 3–5, 1938, by Fritz Plaumann, and the two males

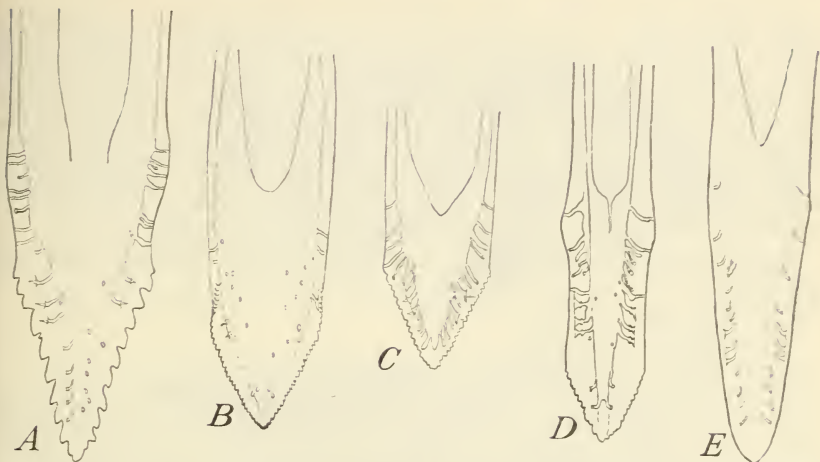


FIGURE 6.—Ovipositor tip of (A) *Anastrepha elegans*, (B) *A. xanthochaeta*, (C) *A. similis*, (D) *A. lanceola*, and (E) *A. quararibaeae*.

determined by Greene as *parallela*, one from S. Bernardino, Paraguay, the other from São Paulo, Brazil. The male is here described for the first time.

ANASTREPHA XANTHOCHAETA Hendel

(Fig. 6, B)

Anastrepha xanthochaeta Hendel, [Dresden] K. Zool. u. Anthrop.-Ethnog. Mus. Abhandl. u. Ber. 14 (3) : 18, 1914; Greene, Wash. Ent. Soc. Proc. 36 : 163, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28 : 516, pl. 63, fig. 4, 1934.

Medium sized, yellow brown. Mesonotum 3.0 mm. long. Thorax uniformly yellow brown. Macrochaetae yellow orange; pile golden yellow. No sternopleural bristle. Wing 7.6 mm. long, the pattern yellow orange; costal band widely separated from S-band except at base of cell first M_2 , which is filled by the S band; V band complete, separated from S band; vein R_{2+3} slightly undulant. *Female terminalia*: Ovipositor sheath 2.6 mm. long, tapering from near base to apex, the spiracles about 0.78 mm. from base. Rasper well developed, the hooks rather short, closely set in three or four rows. Ovipositor 2.2 mm. long, rather stout, the shaft about 0.122 mm. wide, the extreme base but little widened, the tip with small serrations as figured.

Type material.—Holotype female (Vienna Museum).

Type locality.—Rio Grande do Sul, Brazil.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

Through the kindness of Dr. Beier, of the Vienna Museum, the type specimen was sent to the writer with permission to mount the ovipositor. A photograph of the type, showing the wing pattern, was published by Costa Lima in the publication cited.

ANASTREPHA SIMILIS Greene

(Fig. 6, C; pl. 7, A)

Anastrepha similis Greene, Wash. Ent. Soc. Proc. 36 : 153, pl. 20, fig. 5, 1934; Costa Lima, O Campo 8 (90) : 37, 1937.

Rather small to medium sized, orange yellow. Mesonotum 3.2–3.6 mm. long, the humerus, an indistinct median stripe widening abruptly to include the prescutellar bristles, a lateral stripe from transverse suture to scutellum,

and scutellum pale yellow; pleura yellow and orange yellow; metanotum entirely orange yellow. Macrochaetae dark brownish to black; pile pale yellow brown. Sternopleural bristle very slender. Wing 7.25–7.8 mm. long, the bands yellow orange and brown, complete, disconnected. *Female terminalia*: Ovipositor sheath 2.9–3.25 mm. long, tapering apically, the spiracles 0.85–0.95 mm. from base; sheath orange brown, the apical half dark brown. Rasper of rather closely set hooks in five or six rows. Ovipositor 2.75–2.9 mm. long, rather stout, the base distinctly widened, the tip short and broad, finely serrate on a little less than apical two-thirds, the serrations all lateral. *Male terminalia*: Tergal ratio about 0.75; clasper about 0.2 mm. long, stout, the apical portion somewhat flattened, blunt, the teeth somewhat distad of middle.

Type material.—Holotype female (United States National Museum).

Type locality.—Cabima, Panama.

Distribution.—Panama.

Food plant.—Unknown.

Thirteen specimens of this species have been trapped at La Campana and El Cermeño, Panama, in June and July by James Zetek. The male is here described for the first time. The paratype of this species proves to have an ovipositor very different from that of the holotype (see *dissimilis*, new species).

ANASTREPHA LANCEOLA, new species

(Fig. 6, D; pl. 7, B)

Rather small, yellow orange. Mesonotum 3.0–3.75 mm. long. Thorax with pale-yellow markings as follows: A slender median line greatly expanded on posterior third of mesoscutum; lateral stripe from transverse suture to scutellum; humerus; all but extreme base of scutellum; upper portion of mesopleuron; around wing base; metapleuron. Occasionally the scutoscuteellar suture is faintly darkened medially; metanotum uniformly yellow orange. Macrochaetae black; pile yellow brown. Sternopleural bristle rather slender. Wing 6.6–7.5 mm. long, the bands yellow orange and brown, all disconnected. *Female terminalia*: Ovipositor sheath 4.5–5.25 mm. long, slender, the apical half darkened, the spiracles about 1.1 mm. from base. Rasper of about 20 rather large hooks in 3–4 rows. Ovipositor 4.2–4.7 mm. long, rather slender, the extreme base not greatly widened, the tip of unusual shape as shown in figure 6, D, usually with minute serrations on the apical portion. *Male terminalia*: Tergal ratio about 1.0; clasper about 0.22 mm. long, flattened, the outer margin slightly concave near apex, the inner margin beyond teeth convex, the tip rather acute; teeth about at middle.

Type material.—Holotype female (United States National Museum No. 51659; paratypes, 16 females, 11 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—El Cermeño, Panama.

Distribution.—Panama.

Food plant.—Unknown.

The holotype was trapped June 20, 1939, by James Zetek; the paratypes were trapped at El Cermeño and La Campana, Panama, and Balboa, Canal Zone, from March to June.

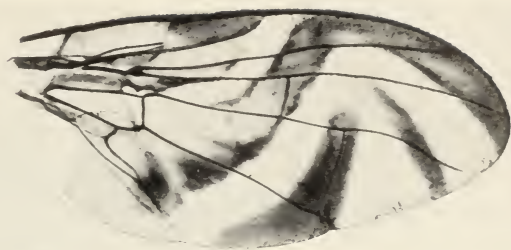
The female may readily be distinguished from that of other species by the peculiarly shaped ovipositor tip.

ANASTREPHA QUARARIBAE Costa Lima

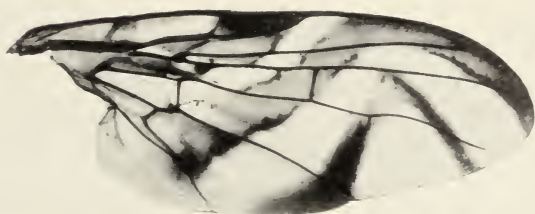
(Fig. 6, E; pl. 7, C)

Anastrepha quararibae Costa Lima, O Campo 8 (90): 35, figs. 1–2, pl. 1, figs. 6 and 8, pl. 2, fig. 4, 1937.

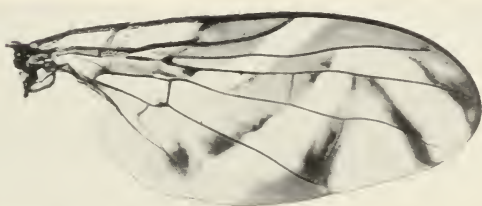
Small to rather small, pale yellow to yellow orange. Mesonotum 1.95–3.0 mm. long. Thorax mostly pale yellow except for a pair of irregular stripes on scutum,



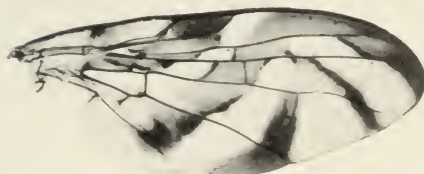
A



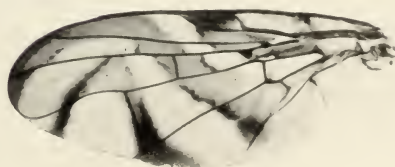
B



C



D



E

Wing of (A) *Anastrepha similis*, (B) *A. lanceola*, (C) *A. quararibensis*, (D) *A. crebra*, and (E) *A. minuta*.



part of pleura, and sides of metanotum, which are yellow orange. Macrochaetae yellow orange; pile pale yellow. Sternopleural bristle rather strong. Wing 4.5–6.1 mm. long, the bands yellow brown; basal and S bands separated or occasionally touching; V band narrowly connected with S band or occasionally slightly separated; vein R_{4+5} slightly undulant. *Female terminalia*: Ovipositor sheath 1.95–2.25 mm. long, the spiracles about 0.75 mm. from base. Rasper of rather few hooks in three or four rows. Ovipositor 1.8–2.0 mm. long, the base slightly widened, the tip rather stout with no serrations, its apex blunt. *Male terminalia*: Tergal ratio 1.0 or a little less; clasper about 0.25 mm. long, the basal portion stout, the apical portion flattened and slender; outer margin concave, inner margin beyond teeth straight or slightly concave, the extreme apex of clasper slightly turned inward; teeth about at middle.

Type material.—Cotype females and males (Instituto Oswaldo Cruz).

Type locality.—Bahia, Brazil.

Distribution.—Known only from the type locality.

Food plants.—*Quararibea turbinata* and *Q. "penduliflora."*

The preceding description is based upon 19 specimens reared from *Quararibea "penduliflora"* (probably equals *Q. pendulifera* (St. Hil.) Schum.) by Gregorio Bondar under the same number as some of the cotypes, and one reared by Dr. Bondar from *Q. turbinata* and determined by Costa Lima.

The species is very close to *crebra*, new species, but the latter differs in having black macrochaetae and a slightly more slender, acute ovipositor tip. The claspers of *quararibae* are also more slender apically than those of *crebra*.

ANASTREPHA CREBRA, new species

(Fig. 7, A; pl. 7, D)

Anastrepha obliqua Greene (not Macquart), Wash. Ent. Soc. Proc. 36: 163, pl. 22, fig. 8, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 604, 1934.

Small, yellow brown. Mesonotum 2.28–2.90 mm. long. Humerus, median stripe widening posteriorly, lateral stripe from transverse suture to scutellum, and scutellum pale yellow; upper margin and posterior portion of side of thorax pale yellow; metanotum entirely yellow brown. Macrochaetae black; pile pale yellow brown. Sternopleural bristle rather strong. Wing 4.25–5.50 mm. long, the

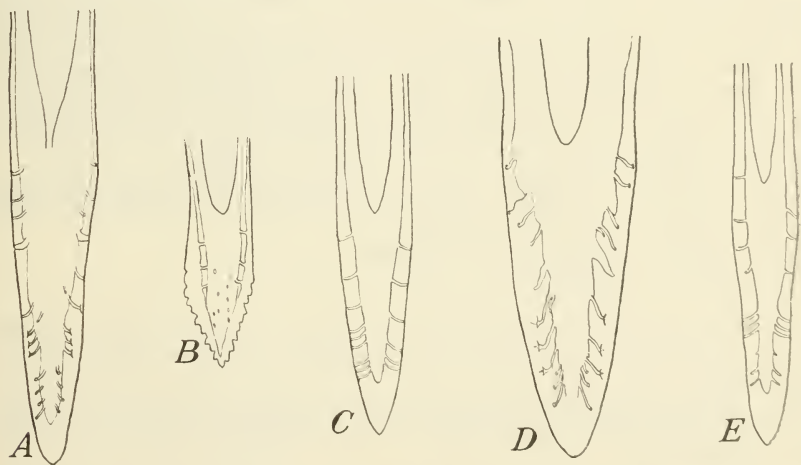


FIGURE 7.—Ovipositor tip of (A) *Anastrepha crebra*, (B) *A. minuta*, (C) *A. insulae*, (D) *A. debilis*, and (E) *A. edentata*.

bands yellow brown; costal and S bands usually well separated; rarely only narrowly separated or touching on vein R_{4+5} ; V band narrowly connected with S band anteriorly; vein R_{2+3} slightly undulant. *Female terminalia*: Ovipositor sheath 1.75-1.90 mm. long, rather stout, tapering apically, the spiracles about 0.7 mm. from base. Rasper well developed, the hooks long, slender, in four or five rows. Ovipositor 1.65-1.75 mm. long, the tip narrow, not serrate laterally; shaft parallel-sided, the base abruptly widened. *Male terminalia*: Tergal ratio about 0.88; clasper about 0.23 mm. long, stout basally, flattened beyond teeth; outer margin of apical portion slightly concave, inner margin strongly convex, the apex acute; teeth about at middle.

Type material.—Holotype female (United States National Museum No. 51660); paratypes, 141 females, 159 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—Barro Colorado Island, Canal Zone.

Distribution.—Panama and Honduras.

Food plant.—*Quararibea asterolepis*.

The type series consists of specimens reared from the food plant by James Zetek, September 9, 1935, under Zetek No. 3531. In addition to this long series, it has been reared several other times from the same fruit, and specimens have been collected and trapped at various places in the Canal Zone and Panama, and at Ceiba, Honduras. It occurs in enormous numbers in the fruit.

This species was determined as *obliqua* (Macquart) by Greene. As pointed out by Costa Lima, however, the original description of *obliqua* does not agree with this species, nor does a specimen examined by the writer that is supposed to be the type of *obliqua*. *Anastrepha quararibae*, from Brazil, is extremely close to *crebra*, but in *quararibae* the macrochaetae are orange and the ovipositor tip is slightly stouter. Because of these differences and the difference in distribution and food plant species it seems better not to refer the Central American specimens to *quararibae*.

ANASTREPHA MINUTA, new species

(Fig. 7, B; pl. 7, E)

Small, yellow. Mesonotum 2.28-2.6 mm. long. Thorax yellow orange, with humerus, scutellum, and most of pleura paler; no dorsal median line apparent. Macrochaetae black; pile pale yellow. Sternopleural bristle moderate. Wing 4.8-5.5 mm. long, the bands yellow orange; costal and S bands separate; S and V bands separate or very narrowly connected. *Female terminalia*: Ovipositor sheath 1.1-1.3 mm. long, stout, the spiracles about 0.44 mm. from base. Rasper of about 15 hooks in three or four rows. Ovipositor 1.0 mm. long, slightly widened at base and near tip, the latter with about nine teeth on each side.

Type material.—Holotype female; paratypes, two females (United States National Museum No. 51661).

Type locality.—La Campana, Panama.

Distribution.—Panama.

Food plant.—Unknown.

The holotype and one paratype were trapped May 25, 1938, by James Zetek. The second paratype was trapped at Balboa, Canal Zone, July 6, 1938.

This species superficially very closely resembles *crebra*, new species, but the shorter ovipositor sheath and very different ovipositor serve to distinguish it.

ANASTREPHA SUBMUNDA Costa Lima

Anastrepha submunda Costa Lima, O Campo 8 (90): 37, figs. 5-6, pl. 1, figs. 4-5, pl. 2, fig. 3, 1937.

Medium sized, yellow brown. Thorax with pale yellow in the usual pattern; metanotum not distinctly darkened laterally. Macrochaetae black. Sternopleural bristle moderate. Wing 6.25-8 mm. long, all bands separated and the V band sometimes broken above. *Female terminalia*: Ovipositor sheath 2.5 mm. long, rather stout, the spiracles about 1 mm. from base. Rasper of about 30 teeth. Ovipositor 1.5 mm. long, the tip about 0.14 mm. long, rather blunt, with no serrations. *Male terminalia*: Tergal ratio a little less than 1.0; clasper about 0.22 mm. long, rather stout, the apical portion somewhat flattened, with a rounded tip; teeth about at middle.

Type material.—Cotype females and males (Instituto Oswaldo Cruz).

Type locality.—Bahia, Brazil.

Distribution.—Known only from type locality.

Food plants.—Reared from fruits with the Brazilian vernacular names of "pinha vermelha de leite" and "mucuri branco," the former of the family Annonaceae, the latter Sapotaceae.

This species has not been seen by the writer, the foregoing description being based on the original one.

ANASTREPHA INSULAE, new species

(Fig. 7, C; pl. 8, A)

Small, yellow brown. Mesonotum 2.5 mm. long. Humerus, a narrow lateral stripe from transverse suture to scutellum, an area anterior to scutellum and of about the same size and shape as scutellum, with a narrow median projection anteriorly, scutellum, and most of pleura pale yellow. Macrochaetae black; pile pale yellow. Sternopleural bristles both lost, but the bristle scars large. Wing 5.3 mm. long, the bands rather dark brown and pale yellow; costal and S bands broadly disconnected although area between costa and vein R_{2+3} faintly yellowish; V band very faint above, almost touching S band. *Female terminalia*: Ovipositor sheath 2.44 mm. long, the apical two-fifths slender; spiracles about 0.6 mm. from base. Rasper of long slender hooks in five or six rows. Ovipositor 2.4 mm. long, slender, the tip with no serrations, the extreme base widened.

Type material.—Holotype female (United States National Museum No. 52945).

Type locality.—Isle of Pines, Cuba, West Indies.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

The specimen was collected on grapefruit.

This species is near *crebra*, new species, or *submunda*, but differs particularly from the former in wing pattern and from the latter in the shape of the ovipositor tip.

ANASTREPHA DEBILIS, new species

(Fig. 7, D; pl. 8, B)

Rather small, yellow. Mesonotum 2.66-3.4 mm. long. Entire thorax yellow. Macrochaetae yellow brown; pile yellow. Sternopleural bristle absent or very weak. Wing 6.25-7.25 mm. long, the bands yellow orange, all complete, separated; hyaline area between costal and S bands slightly narrowed anteriorly; vein R_{2+3} somewhat sinuous; vein M_{1+2} turned forward to meet end of S band. *Female terminalia*: Ovipositor sheath 2.65-2.9 mm. long, rather swollen basally, tapering to apical third and then slightly widened to apex; spiracles about 0.9 mm. from base. Hooks of rasper moderate in size, in five or six rows. Ovipositor 2.6-2.85 mm. long, rather stout, the base abruptly widened, the tip not serrate.

Male terminalia: Tergal ratio about 1.0; clasper about 0.3 mm. long, stout basally, flattened apically, the apical portion broadly rounded, with setae on posterior surface near edge, longer medioapically; teeth slightly distad of middle.

Type material.—Holotype female (United States National Museum No. 53215); paratypes, 37 females, 26 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—La Campana, Panama.

Distribution.—Panama.

Food plant.—Unknown.

The holotype was trapped December 28, 1938, by James Zetek. The paratypes were all trapped at the type locality, September 22 to November 1937, and September 28, 1938, to January–February 1939. Specimens have also been trapped at El Cermeño.

This species is characterized by its nearly uniformly yellow color, the course of veins R_{2+3} and M_{1+2} , the wing pattern, and the shape of the ovipositor. The species is apparently close to *A. borgmeieri*, of which only the male is known, but in the latter species vein M_{1+2} does not turn forward so much, vein R_{2+3} is even more undulant, and the sternopleural bristle is stronger. Costa Lima compared a male of *debilis* with the type of *borgmeieri*.

ANASTREPHA EDENTATA, new species

(Fig. 7, E; pl. 8, C)

Anastrepha sp. F. Brown, Fla. State Plant Bd. Bien. Rpt. 11: 20–21, 1937.

Small, yellow brown. Mesonotum 2.28–3.0 mm. long. Humerus, a very narrow median stripe widening abruptly on mesoscutum posteriorly, lateral stripes from transverse suture to scutellum, and scutellum pale yellow; upper portion of mesopleuron and entire metapleuron pale yellow; metanotum entirely yellow brown. Macrochaetae black; pile pale yellow brown. Sternopleural bristle strong, as large as pteropleural bristle. Wing 4.6–6.1 mm. long, the bands yellow brown; costal and S bands widely separated on vein R_{4+5} but usually closer on vein R_{2+3} and sometimes connected here, or all of cell R infuscated between the two bands; V band complete and usually joined to S band. *Female terminalia*: Ovipositor sheath 3.25–4.0 mm. long, slender and tapering, the spiracles 0.8–0.9 mm. from base. Rasper well developed, the hooks long, slender, in about five rows. Ovipositor 3.1–3.8 mm. long, slender, the extreme base abruptly widened, the tip about 0.06 mm. wide, without serrations. *Male terminalia*: Tergal ratio about 1.0; clasper about 0.18 mm. long, stout basally, the apical portion flattened, the sides tapering rather evenly to the rather acute apex; teeth about at middle.

Type material.—Holotype female (United States National Museum No. 53895); paratypes, 25 females, 24 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—Key Largo, Fla.

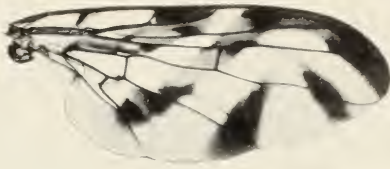
Distribution.—Florida Keys from Key Largo to Key West; Redlands, Dade County, Fla.; Mayaguez, P. R.

Food plant.—Unknown.

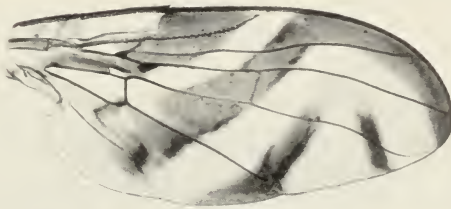
The holotype was collected at Key Largo, Fla., September 14, 1936, by Barcus and McDaniel. Two of the paratypes were collected at Mayaguez and the remainder in various places on the Florida Keys by collectors for the State Plant Board of Florida. The species has been taken in every month of the year on the Florida Keys but the host has not been discovered. One specimen was collected on the mainland of Florida, as mentioned above.

Anastrepha edentata is very close to *A. tubifera*, but the latter is apparently larger and has a slightly different wing pattern.

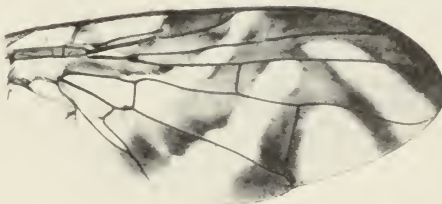
A



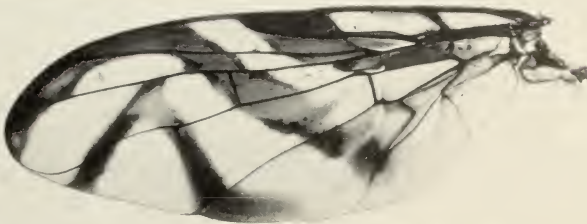
B



C



D



Wing of (*A*) *Anastrepha insulæ*, (*B*) *A. debilis*, (*C*) *A. edentata*, and (*D*) *A. tubifera*.

ANASTREPHA TUBIFERA (Walker), new combination

(Pl. 8, D; pl. 23, D)

Trypeta tubifera Walker, Roy. Ent. Soc., London, Trans. 4: 230, 1858.

Medium sized, yellow brown. Mesonotum 3.8 mm. long. Thorax rather uniformly yellow brown, the paler-yellow markings indistinct; sides of metanotum not darkened. Macrochaetae black; pile light, yellowish brown. Sternopleural bristle well developed, nearly as large as pteropleural. Wing 8.45 mm. long, the bands yellow and brown; costal cell nearly hyaline; all bands separated. *Female terminalia*: Ovipositor sheath 4.47 mm. long, the spiracles about 1.18 mm. from base. Rasper of rather long, curved hooks. Ovipositor 3.94 mm. long, slender, the base slightly widened, the tip about 0.07 mm. wide, with no serrations.

Type material.—Holotype female (British Museum).

Type locality.—Given as China. This is, with little doubt, an error. The species most closely resembles certain Antillean species, and it is not improbable that it actually came from the West Indies.

Distribution.—Known only from the type specimen.

Food plant.—Unknown.

This species was not recognized as an *Anastrepha* until Dr. Smart called the writer's attention to it. He mounted the wing and dissected the terminalia, providing him with the excellent photographs reproduced in this paper. The foregoing description was submitted to Dr. Smart, who checked it with the type and inserted the length of the mesonotum.

The species closely resembles *edentata*, new species, and *aphelocentema*, new species, differing from the former as indicated in the key and from the latter in having a more slender ovipositor tip and a stronger sternopleural bristle.

ANASTREPHA LOEWI, new species

(Fig. 8, A; pl. 9, A)

Anastrepha integra Hendel (not Loew), [Dresden] K. Zool. u. Anthropol.-Ethnograph. Mus. Abhandl. u. Ber. 14 (3): 15, 1914 (part).

Medium sized, yellow brown. Male paratype with a dark spot below eye. Mesonotum 3.2-3.4 mm. long, pale yellow, with orange-brown color in a pair of submedian stripes from anterior margin nearly to level of acrostichal bristles and sublateral stripes from behind humerus to scutellum, broken at transverse suture. Metanotum entirely orange brown. Macrochaetae black; pile yellow brown. Sternopleural bristle moderate. Wing 7.4-8.9 mm. long, the bands orange brown; the hyaline area between costal and S bands narrowest at costal margin; V band complete, separated from S band; vein R_{2+3} strongly undulant, cell R₁ constricted opposite cross-vein *r-m*, which is slightly proximad of apex of vein R₁; vein M_{1-2} scarcely turned forward at apex. *Female terminalia*: Ovipositor sheath 3.5 mm. long, rather stout basally, the spiracles 1.1 mm. from base. Rasper of about 20 very stout hooks in two or three rows. Ovipositor 3.25 mm. long, stout, the base slightly broadened, the tip broad, with no serrations. *Male terminalia*: Tergal ratio about 1.0; clasper about 0.39 mm. long, stout basally, flattened apically, the lateral margin straight and produced distally and posteriorly from rest of clasper forming a thin carina on the lateral, posterior margin extending to a sharp point beyond the rounded end of the median surface; teeth about at middle.

Type material.—Holotype female (United States National Museum No. 53896); paratypes, one male, one female (United States National Museum and Vienna Museum).

Type locality.—La Campana, Panama.

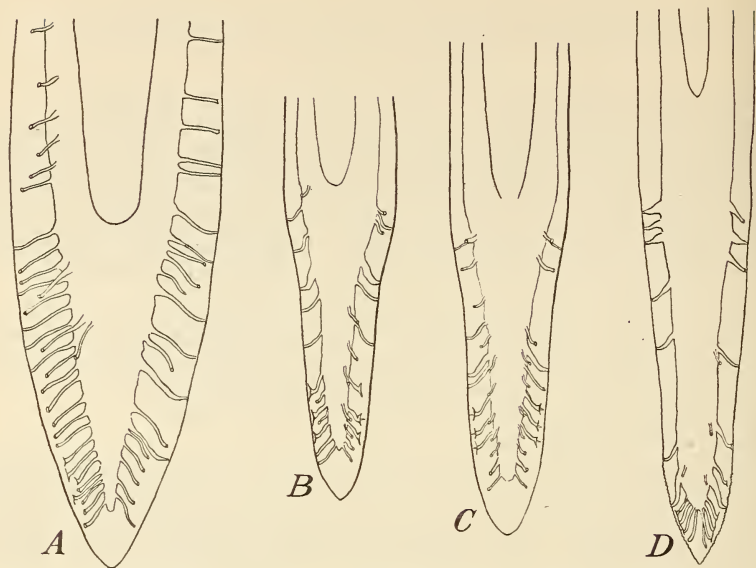


FIGURE 8.—Ovipositor tip of (A) *Anastrepha loewi*, (B) *A. undosa*, (C) *A. aphelocentema*, and (D) *A. barnesi*.

Distribution.—Panama and Venezuela.

Food plant.—Unknown.

The holotype was trapped December 20, 1938, the male paratype June 29, 1938, by James Zetek. The female paratype is the specimen from Venezuela determined by Hendel as *Anastrepha integra* (Loew), from which it differs in having a much shorter ovipositor sheath. This specimen was lent the writer through the kindness of Dr. Beier, of the Vienna Museum, and the figure of the ovipositor tip is from this specimen.

ANASTREPHA UNDOSA, new species

(Fig. 8, B)

Large, orange brown. Mesonotum 4.5 mm. long, orange brown, with two pairs of rather narrow, darker-brown stripes and a transverse band; the submedian stripes rather widely separated, extending from anterior margin to a point halfway between transverse suture and scutellum; the sublateral stripes, from a short distance behind transverse suture nearly to scutellum, just laterad of dorso-central bristles; the transverse band just anterior to scutellum; sides of mesonotum dark brown. Macrochaetae nearly black; pile yellow brown. No sternopleural bristle. Wing 10.5 mm. long, rounded apically, the bands yellow brown; costal and S bands separated; V band complete, rather broadly joined to S band; Vein R_{2+3} strongly undulant, being upcurved proximad and distad of cross vein $r-m$, downcurved between these points. *Female terminalia*: Ovipositor sheath 4.5 mm. long, moderately stout, the spiracles about 1.3 mm. from base. Rasper of many rather slender hooks in five or six rows. Ovipositor 4.25 mm. long, moderately stout, the base abruptly widened, the tip slender (at greatest width about 0.105 mm.), distinctly narrowed beyond apex of oviduct, with no serrations.

Type material.—Holotype female (American Museum of Natural History).

Type locality.—Piedra B. (Argentina ?).

Distribution.—Known only from the holotype.

Food plant.—Unknown.

The single specimen is labeled "April, S. W. Williston Collection." It is possible that the locality label refers to one of the "Piedras Blancas" in Argentina.

The species is closest to *parallela*, but in *parallela* the metanotum is not darkened laterally, cell R_3 is constricted beyond cross vein $r-m$ rather than at it, the thoracic pattern is different, and the ovipositor is usually longer.

ANASTREPHA COSTALIMAI Autuori

Anastrepha costalimai Autuori, Rev. de Ent. 6: 194, figs. 1-3, 1936; Costa Lima, O Campo 9 (95): 62, pl. 7, fig. 2, 1938.

Rather large, yellow brown, the thorax with paler-yellow markings in the usual pattern. Mesonotum 4.1 mm. long. Macrochaetae black; pile yellow brown. Wing 9 mm. long, the bands brown and yellow orange; all bands disconnected and V band somewhat faded anteriorly; vein M_{1+2} turned forward more than usual so that cell second M_2 reaches end of S band. *Female terminalia*: Ovipositor sheath 3.5 mm. long. Ovipositor tip at widest about 0.125 mm. wide, tapering, not serrate. *Male terminalia*: Clasper stout basally, the apical portion somewhat curved, the apex blunt; teeth about at middle.

Type material.—Cotypes, female and male (Instituto Biologico de São Paulo).

Type locality.—Campo Bello, Santo Amaro, São Paulo, Brazil.

Distribution.—State of São Paulo, Brazil.

Food plant.—Unknown.

The two cotypes were collected at the same place. Costa Lima figured the male terminalia of a specimen collected in São Paulo. The species has not been seen by the writer, the foregoing description being derived from the original one and Costa Lima's figure.

The species is very close to *leptozona*, particularly in the curvature of vein M_{1+2} , in general size, and in the character of the male terminalia. It also resembles *greenei* and *aphelocentema*, new species, but these lack the unusual curvature of vein M_{1+2} , and the male claspers are differently shaped.

ANASTREPHA APHELOCENTEMA, new species

(Fig. 8, C; pl. 9, B)

Rather small to medium sized, yellow brown. Mesonotum 3.0-3.5 mm. long, yellow orange, the humerus, a lateral stripe from transverse suture to scutellum, a slender median stripe abruptly widened on posterior third to include acrostichal and dorsocentral bristles, and scutellum pale yellow; pleura predominantly pale yellow; metanotum yellow orange, with a pale-yellow median stripe. Macrochaetae black; pile pale yellow brown. Sternopleural bristle slender, dark. Wing 7.25-8.0 mm. long, the bands yellow orange and brownish; costal, S. and V bands all separated; vein M_{1+2} scarcely turned forward at apex. *Female terminalia*: Ovipositor sheath 3.9-4.1 mm. long, tapering to apical fourth, which is somewhat depressed with a distinct lateral crease. Rasper of moderate-sized hooks in six or seven rows. Ovipositor 4.2 mm. long, rather stout, the base abruptly widened, the tip about 0.11 mm. wide, slightly narrowed beyond apex of oviduct, with no serrations. *Male terminalia*: Tergal ratio about 1.09; clasper about 0.3 mm. long, stout at base, flattened and slightly twisted distally, the outer margin broadly convex to beyond teeth, then convex to the acute apex; teeth slightly distad of middle.

Type material.—Holotype female; paratypes, two females, one male (United States National Museum No. 53897).

Type locality.—Tamazunchale, San Luis Potosi, Mexico.

Distribution.—Known only from the type locality.

Food plant.—Socavitaie (probably *Lucuma* sp.).

The type series was collected and reared by J. W. Monk in a fruit known locally as socavitaie. The identity of this food plant is uncertain. The name of this species is the one used by A. C. Baker in manuscript in reference to the nonserrate ovipositor tip.

ANASTREPHA GREENEI Costa Lima

Anastrepha greenei Costa Lima, O Campo 8 (90): 37, figs. 3-4, pl. 1, fig. 7, pl. 2, fig. 2, 1937.

Small, yellow brown. Macrochaetae nearly black. Wing about 5.5 mm. long, the bands yellow to brown, all separated, complete. *Female terminalia*: Ovipositor sheath 3.7 mm. long. Rasper with more than 40 hooks. Ovipositor 3.5 mm. long, the tip about 0.12 mm., rather short, with no serrations. *Male terminalia*: Tergal ratio more than 1.0; clasper about 0.32 mm. long, rather slender, the teeth somewhat proximad of middle.

Type material.—Holotype female, allotype, and paratypes (Instituto Oswaldo Cruz).

Type locality.—Bahia, Brazil.

Distribution.—Known only from the type locality.

Food plants.—*Quararibea turbinata* and *Q. "penduliflora."*

The preceding description is based upon the original one, since no specimens are before the writer.

ANASTREPHA BARNESI Aldrich

(Fig. 8, D; pl. 9, C)

Anastrepha barnesi Aldrich, U. S. Nat. Mus. Proc. 66 (18): 3, 1926; Greene, Wash. Ent. Soc. Proc. 36: 166, pl. 23, fig. 2, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 516, 1934.

Anastrepha (?) *barnesi* or *virescens* Costa Lima, O Campo 8 (92): 63, figs. 15-16, pl. 3, figs. 1 and 5, pl. 4, fig. 1, 1937. (New synonymy.)

Large, yellow brown. Mesonotum 3.8-4.6 mm. long; mesoscutum brown, with a pale-yellow lateral stripe from transverse suture to scutellum; pleura with yellow stripe above. Macrochaetae black; pile yellowish. Sternopleural bristle absent. Wing 9.25-10.5 mm. long, the bands yellow brown; all bands separated; vein M_{1+2} turned forward to meet the apex of S band. *Female terminalia*: Ovipositor sheath 10.6 mm. long, tapering to beyond middle and then slightly widened to apex; spiracles about 1.6 mm. from base. Rasper well developed, the hooks in three or four rows. Ovipositor 10 mm. long, slender, the tip as figured; the minute serrations near apex not visible at 60X magnification. *Male terminalia*: Tergal ratio about 1.1; clasper about 0.3 mm. long, stout, the outer margin gently convex to near apex and then abruptly curved laterally and posteriorly to a truncate apex; inner margin strongly convex; teeth subapical.

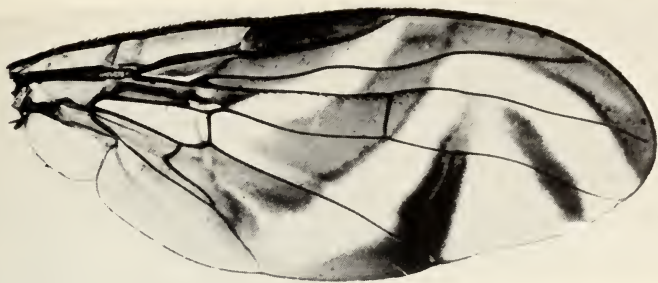
Type material.—Holotype female, paratype female (United States National Museum).

Type locality.—Cayuga, Guatemala.

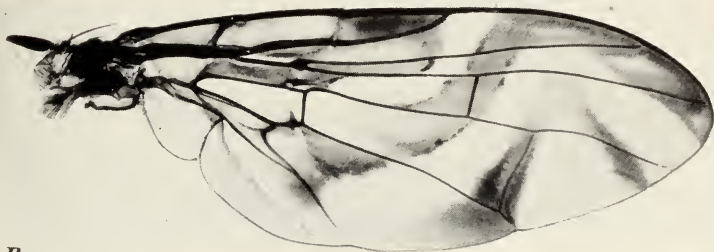
Distribution.—Guatemala, Panama, British Guiana, and Brazil.

Food plant.—Unknown.

There is one female in the British Museum from Morabelli Creek, Essequibo River, British Guiana. The two specimens collected in the Federal District, Brazil, and determined tentatively by Costa Lima



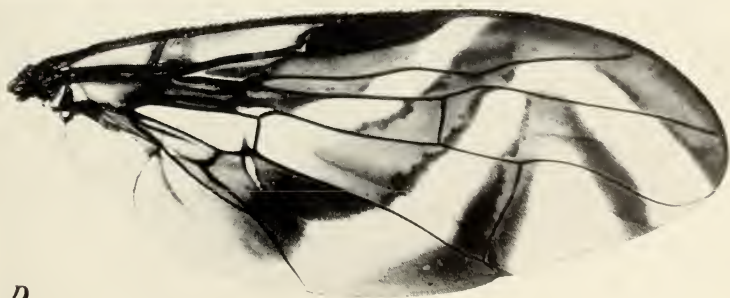
A



B

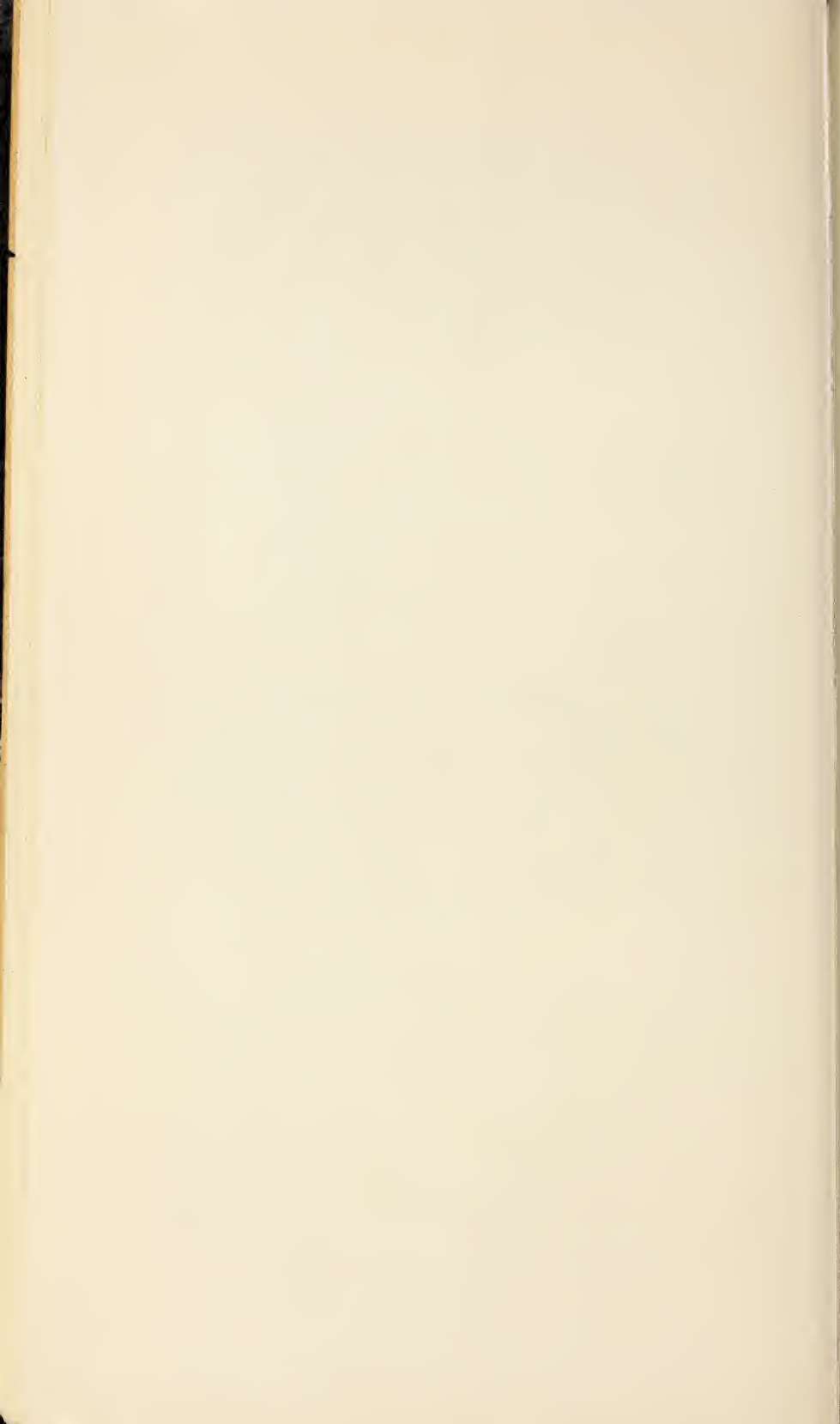


C



D

Wing of (A) *Anastrepha loewi*, (B) *A. aphelocentema*, (C) *A. barnesi*, and (D) *A. parallela*.



as *barnesi* or *virescens*, new species, appear to be *barnesi*. The ovipositors of these two specimens are slightly longer, but in ovipositors of this length a small difference is not significant. The ovipositor tip figured by Costa Lima has exactly the same proportions as that of the type of *barnesi*, differing only in being slightly blunter. Zetek trapped two males on Barro Colorado Island, Canal Zone, two males and two females at La Campana, Panama, and two females at El Cermeño, Panama. The male is here described for the first time.

The combination of a very long ovipositor sheath and a wing pattern with all the bands separated will distinguish this species; in addition, it may be distinguished from *pallidipennis* and *superflua* by its unswollen clypeal ridge, from the former by the position of the spiracles, and by the ovipositor sheath, and from *zeteki* by its black macrochaetae.

ANASTREPHA INTEGRA (Loew)

(*Trypeta*) *Acrotoxa integra* Loew, Smithsn. Inst. Misc. Collect. 11 (256): 230, pl. 11, fig. 23, 1873.

Anastrepha integra (Loew): Costa Lima, Inst. Oswaldo Cruz Mem. 28: 514, 1934.

Large, the body, exclusive of ovipositor sheath, 10.3 mm. long. Wing 10.6 mm. long, the bands yellowish brown; costal and S bands separated rather widely across Rs, nearly touching at anterior wing margin; V band complete, separated from S band. *Female terminalia*: Ovipositor sheath 9.1-9.5 mm. long.

Type material.—Cotypes, male and female (collection unknown, but not found in Cambridge Museum; perhaps at Berlin).

Type locality.—Brazil.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

This species has not been recognized by the writer or by recent workers, although both Hendel and Greene determined specimens as this. The specimen so determined by Hendel is herein described as *loewi*, new species, and the unusual species so determined by Greene, as *convoluta*, new species. The ovipositor sheath for each of these two species is much shorter than as given by Loew. The species most closely resembling *integra* is *barnesi*, but this synonymy cannot be proved and the wing patterns are slightly different. It is also possible that *integra* belongs to the long-tailed group with a swollen clypeus, although none of the known species has a similar wing pattern.

ANASTREPHA PARALLELA (Wiedemann)

(Fig. 9, A; pl. 9, D)

Dacus parallelus Wiedemann, Aussereuropäische Zweiflügelige Insekten, v. 2, p. 515, 1830 (in part).

(*Trypeta*) *Acrotoxa parallela* (Wiedemann): Loew, Smithsn. Inst. Misc. Collect. 11 (256): 229, pl. 11, fig. 20, 1873.

Anastrepha parallela (Wiedemann): Bezzi, Portici R. Scuola Super. di Agr. Lab. Zool. Gen. e Agr. Bol. 3: 283, 1909; Hendel, [Dresden] K. Zool. u. Anthrop.-Ethnog. Mus. Abhandl. u. Ber. 14 (3): 13, pl. 1, fig. 9, 1914; Bezzi, Chacaras e Quintaes 19: 374, fig. 2 (8), 1919; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 517, 1934; O Campo 8 (90): 34 and (92): 61, figs. 13-14, pl. 3, fig. 3, pl. 4, fig. 3, 1937.

Rather large to large, orange brown. Mesonotum 3.7-4.7 mm. long. Thorax orange brown with no distinct median stripe, but humerus, lateral stripes from transverse suture to scutellum, scutellum, and parts of pleura paler; metanotum

uniformly orange brown. Macrochaetae black; pile golden yellow. No sterno-pleural bristle. Wing 8.6–10.4 mm. long, the bands orange brown; costal and **S** bands separate; V band complete, separated from **S** band or narrowly connected; vein R_{2+3} undulant, and both veins of R_s approaching each other distad of cross vein $r-m$; in one specimen both wings have a cross vein r at this point; vein M_{1+2} turned forward apically to reach apex of **S** band. *Female terminalia*: Ovipositor sheath 5–5.5 mm. long, the spiracles about 1.3 mm. from base. Rasper of rather long hooks in four or five rows. Ovipositor 4.1–5.2 mm. long, rather slender, the base not greatly widened, the tip with no serrations. *Male terminalia*: Tergal ratio about 1.27; clasper about 0.22 mm. long, stout basally, somewhat flattened apically, the outer margin convex to the bluntly angular apex; teeth subapical.

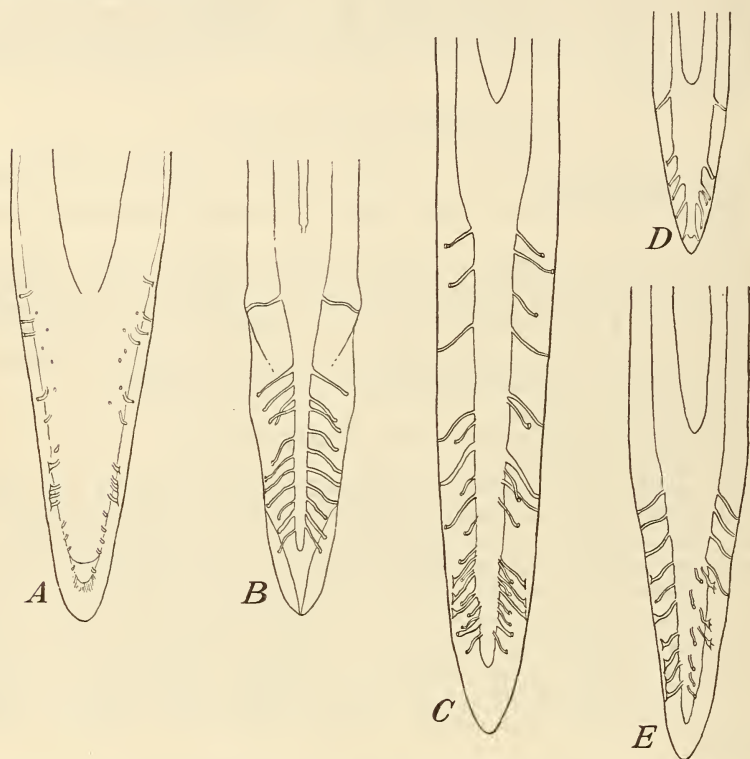


FIGURE 9.—Ovipositor tip of (A) *Anastrepha parallela*, (B) *A. hastata*, (C) *A. scobinae*, (D) *A. kuhlmanni*, and (E) *A. mucronota*.

Type material.—Cotypes, males and females (Vienna Museum, Frankfurt Museum, United States National Museum).

Type locality.—Brazil.

Distribution.—Brazil. It was also reported from Mexico and Paraguay by Hendel; the former locality, at least, is probably erroneous.

Food plants.—*Lucuma* sp. and *Sterculia* sp.

The foregoing description is based upon a cotype male from the Vienna Museum deposited in the United States National Museum, and four specimens reared by Gregorio Bondar at Bahia, Brazil. As Costa Lima has pointed out, the specimens mentioned by Greene

are not this species. (See *elegans*.) Costa Lima also described one of the cotypes of *parallela* as a new species, *Anastrepha zernyi*, and this has since been placed in the genus *Lucumaphila*. The writer has followed Loew and Costa Lima in considering *parallela* to be the species with the strongly bent veins of the radial sector, a character very evident in the cotype at hand. One of the specimens reared by Dr. Bondar is smaller, with a shorter ovipositor than the others and with the veins of the radial sector only weakly undulant. Since the ovipositor tip agrees very well and it was reared at the same time as typical *parallela*, however, it is probably the same. Because of its shorter ovipositor it would run in the key to *costalimai*, but the ovipositor tip and the sensory ducts are slightly different, and in *costalimai* there is no indication of the undulation of the veins of the radial sector.

ANASTREPHA BORGMEIERI Costa Lima

Anastrepha borgmeieri Costa Lima, Inst. Oswaldo Cruz Mem. 28: 518, fig. 19, pl. 67, fig. 21, 1934.

Small, entirely yellow orange, with no yellow or black markings. Macrochaetae yellow. Sternopleural bristle present. Wing 5.5 mm. long, the bands yellow brown, all separated. Vein R_{2+3} undulant, so that cell R_3 is widened proximad of cross vein $r-m$ and constricted opposite this cross vein. *Male terminalia*: Tergal ratio distinctly more than 1.0; clasper about 0.27 mm. long, stout basally, flattened apically, the teeth about at middle.

Type material.—Holotype male (Instituto Oswaldo Cruz).

Type locality.—Rio de Janeiro, Brazil.

Distribution.—Known from the type locality only.

Food plant.—Unknown.

The writer has not seen this species, the foregoing description being based upon the original one. Costa Lima compared this with *parallela*, and even suggested that they might prove to be the same in spite of the difference in size. In *parallela*, however, cell R_3 is constricted distad of cross vein $r-m$, and the male terminalia are not the same. The new species *debilis* also resembles *borgmeieri*, but Costa Lima compared a male with the type of *borgmeieri* and declared them to be quite different.

ANASTREPHA HASTATA, new species

(Fig. 9, B)

Rather large, yellow brown. Clypeal ridge slightly convex in profile. Mesonotum 3.7 mm. long, uniformly yellow brown, metanotum entirely yellow brown. Macrochaetae nearly black; pile yellow. Sternopleural bristle very weak. Wing 9.9 mm. long, rounded apically, with yellow-brown bands; hyaline area between basal and S bands unbroken and only slightly narrowed at vein R_{4+5} ; vein R_{2+3} slightly undulant; vein M_{1+2} turned forward only slightly. *Female terminalia*: Ovipositor sheath 5.5 mm. long, narrowest at apical third, the spiracles 1.66 mm. from base. Rasper well developed, the hooks abundant, in seven or eight rows. Ovipositor 5.2 mm. long, the tip without serrations, but slightly swollen at two points as shown in figure 9, B; shaft parallel sided, abruptly widened at base.

Type material.—Holotype female (British Museum).

Type locality.—Amazon.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

This species may be distinguished by its wing pattern and ovipositor shape. The wing pattern is similar to that of *cruzi*, described from a specimen of unknown sex, but in *cruzi* the distal arm of the V band is shorter, the hyaline area between the costal and S bands is narrowed, the wing is less rounded apically, and the mesoscutum is patterned. The convexity of the clypeal ridge is not so strong in *hastata* as it is in *pallidipennis* and related species.

ANASTREPHA SCOBINAE, new species

(Fig. 9, C; pl. 10, A)

Rather large, yellow brown. Mesonotum 4.22 mm. long, pale yellow, with four yellow-orange stripes, the median pair extending from anterior margin four-fifths of way to scutellum, the lateral pair from anterior margin nearly to scutellum, tapering posteriorly and broken at transverse suture; pleura pale yellow and yellow orange; metanotum entirely yellow orange. Macrochaetae black; pile yellow brown. Sternopleural bristle slender. Wing 10 mm. long, the bands yellow orange and brown; all bands separated, the V band complete. *Female terminalia*: Ovipositor sheath 5.0 mm. long, tapering to apical third, which is somewhat depressed and widened; spiracles 1.55 mm. from base. Rasper of many long, slender hooks in five or six rows, merging into the more basal rows of shorter spines. Ovipositor 4.7 mm. long, moderately slender, the base abruptly widened; tip about 0.59 mm. long, nearly parallel-sided to near the acute apex, with no serrations.

Type material.—Holotype female (United States National Museum No. 53898).

Type locality.—El Cermeño, Panama.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

The type was trapped October 17, 1939, by James Zetek.

The species is close to *mucronota*, new species, but the elongate ovipositor tip, longer, more abundant rasper hooks, and straight vein R_{2+3} distinguish it from the latter species.

ANASTREPHA KUHLMANNI Costa Lima

(Fig. 9, D; pl. 10, B)

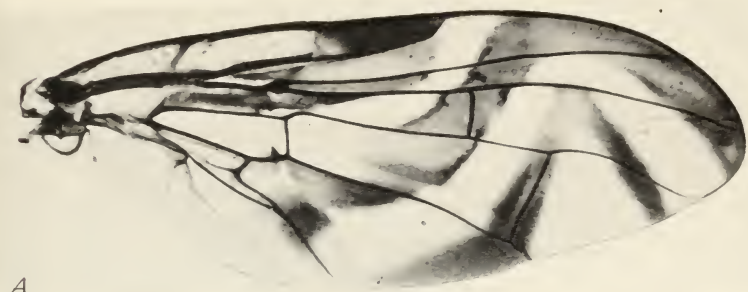
Anastrepha kuhlmanni Costa Lima, Inst. Oswaldo Cruz Mem. 28:520, figs. 20–21, pl. 67, fig. 24, pl. 74, fig. 57, 1934; Blanchard, Soc. Ent. Argentina Rev. 9:41, 1937.

Rather large, yellow brown. Mesonotum 3.7 mm. long, uniformly yellow brown; metanotum not distinctly darkened laterally. Macrochaetae nearly black; pile yellow. Sternopleural bristle weak. Wing 9.2 mm. long, the bands yellow brown; costal and S bands widely separated; V band complete, separated from S band; vein R_{2+3} slightly undulant. *Female terminalia*: Ovipositor sheath 5.2 mm. long, slender, and slightly curved ventrally; spiracles about 1.2 mm. from base. Rasper well developed, the hooks slender, in about eight rows. Ovipositor 4.6 mm. long, slender, the tip about 0.16 mm. long, not serrate; basal two-thirds of shaft nearly parallel sided except for widened base, the apical third gradually tapering. *Male terminalia*: Tergal ratio about 0.65; clasper about 0.34 mm. long, stout, the apex blunt, the teeth subapical.

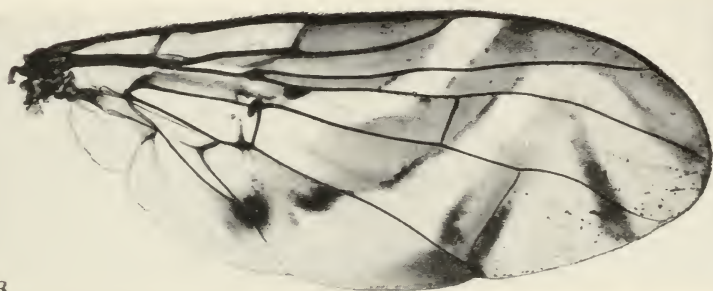
Type material.—Cotypes, females and males (Instituto Oswaldo Cruz and Instituto de Biologia Vegetal, Rio de Janeiro, and the United States National Museum.)

Type locality.—Rio Trapicheiro, Rio de Janeiro, Brazil

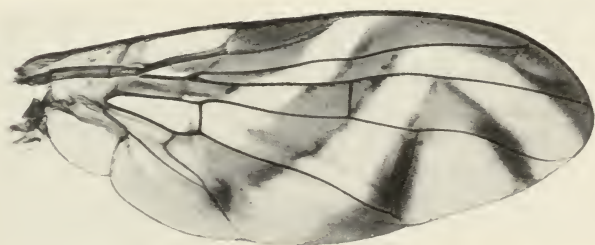
Distribution.—Type locality and Loreto, Misiones, Argentina.



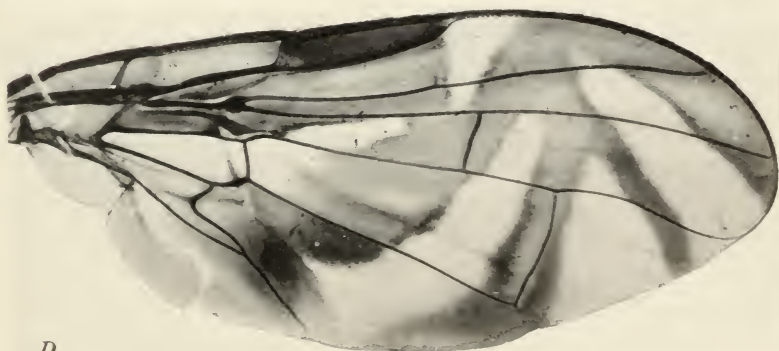
A



B

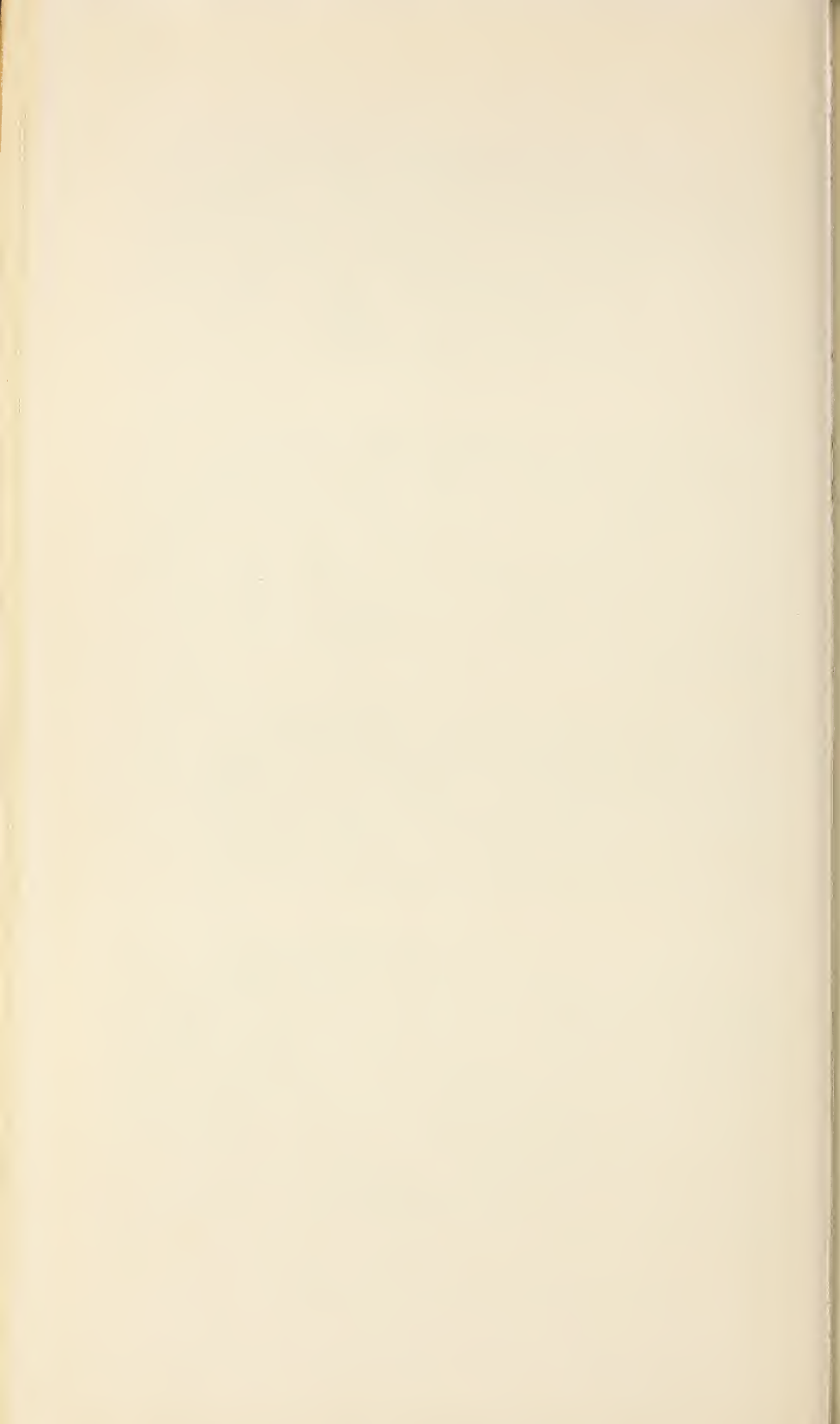


C



D

Wing of (A) *Anastrepha scobinae*, (B) *A. kuhlmanni*, (C) *A. mucronota*, and (D) *A. binodosa*.



Food plant.—*Tetrastylis ovalis*.

This description is based upon a pair of cotypes in the United States National Museum.

The species resembles *tubifera*, but has a considerably shorter ovipositor tip.

ANASTREPHA MUCRONOTA, new species

(Fig. 9, *E*; pl. 10, *C*)

Medium sized, yellow. Mesonotum 3.57 mm. long, yellow, a median stripe widening abruptly posteriorly, lateral stripe from transverse suture to scutellum, and scutellum paler; pleura predominantly pale yellow; metanotum entirely yellow. Macrochaetae black; pile yellow. Sternopleural bristle rather slender. Wing 7.9 mm. long, the bands predominantly yellow orange, complete, all widely separated; vein R_{2+3} slightly undulant opposite crossvein $r-m$. *Female terminalia*: Ovipositor sheath 4.8–5.1 mm. long, slender, tapering posteriorly, the spiracles about 1.1 mm. from base. Rasper of strong, curved hooks in four or five rows. Ovipositor 4.6–4.8 mm. long, slender, the base abruptly widened, the tip about 0.315 mm. long, tapering to a rather acute apex, with no serrations.

Type material.—Holotype female, paratype female (United States National Museum No. 53899).

Type locality.—El Cermeño, Panama.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

The two specimens were trapped by James Zetek at the type locality, the holotype November 21, 1939, the paratype October 10, 1939.

The species most closely related to this are *scobinae*, new species, and *kuhlmanni*, which may be separated by the characters given in the key.

ANASTREPHA BINODOSA, new species

(Fig. 10, *A*; pl. 10, *D*)

Large, orange brown. Mesonotum 4.25 mm. long. Thorax almost unicolorous, the disk of mesoscutum somewhat more orange than the humeri, scutellum, or pleura; metanotum entirely orange brown. Macrochaetae orange brown; pile orange. No sternopleural bristle present. Wing 10.5 mm. long, the bands yellow brown; costal and **S** bands joined along vein R_{4+5} , and the costal hyaline spot reaching to this vein; **V** band broadly joined to **S** band anteriorly. *Female terminalia*: Ovipositor sheath 5.0–5.5 mm. long, the apical half tapered; spiracles about 1.6 mm. from base. Rasper well developed, the hooks long, curved, in four or five rows. Ovipositor 4.0–4.6 mm. long, the shaft straight, with a small swelling at apex of oviduct and another distad, at base of the finely serrate portion; base of ovipositor distinctly widened.

Type material.—Holotype female (British Museum); paratypes, two females (United States National Museum No. 53900 and American Museum of Natural History).

Type locality.—Para, Brazil.

Distribution.—Amazon River Valley, Brazil.

Food plant.—Unknown.

The paratypes were collected at Tapajos and Santarem, respectively, the former being received from the British Museum.

The ovipositor tip of this species is quite different from that of all save *palae*, new species, from Panama, which differs as indicated in the key and in the figures of the ovipositor tips.

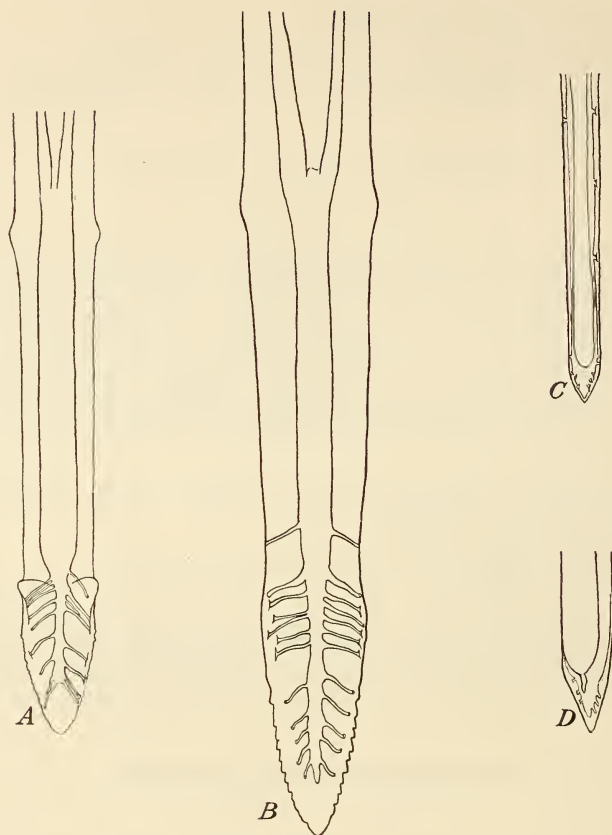


FIGURE 10.—Ovipositor tip of (A) *Anastrepha binodosa*, (B) *A. palae*, (C) *A. montei*, and (D) *A. panamensis*.

ANASTREPHA PALAE, new species

(Fig. 10, B; pl. 11, A)

Rather small to medium sized, orange brown and yellow. Mesonotum 2.95–3.6 mm. long, orange brown, the humerus, median stripe expanding posteriorly to include acrostichal bristles but not reaching scutellum, lateral stripe from transverse suture to scutellum, and scutellum yellow; pleura yellow brown, the upper parts of mesopleuron and sternopleuron, region below wing base, and metapleuron pale yellow; metanotum uniformly orange brown. Macrochaetae black; pile of mesonotum brownish black on darker portions, pale yellowish on lighter portions, as in *mombinpraoptans*; pile of rest of body mostly yellowish brown. No sternopleural bristle. Wing 7.0–8.25 mm. long, the bands orange and rather dark brown; costal and S bands connected; V band complete, separated from S band. *Female terminalia*: Ovipositor sheath 3.57–4.22 mm. long, rather stout, the entire apical half and most of dorsal surface dark brown; spiracles 1.22 mm. from base. Rasper consisting of many rather stout hooks in 9 or 10 rows. Ovipositor 3.4–4.0 mm. long, moderately stout, the base somewhat widened, the tip unusually elongate, with a small protuberance just distad of end of oviduct and slightly widened at base of the short, serrate portion. *Male terminalia*: Tergal ratio about 1.0; claspers about 0.32 mm. long, stout, the apical portion somewhat flattened with an acute apex, and inner margin near apex slightly concave; teeth about at middle.

Type material.—Holotype female; paratypes, four females, one male (United States National Museum No. 53905).

Type locality.—El Cermeno, Panama.

Distribution.—Panama.

Food plant.—Unknown.

The type was trapped by James Zetek, July 5, 1939. The paratypes were trapped at the type locality in July and at La Campana in July and December.

The ovipositor resembles that of *binodosa*, new species, but the species differs as indicated in the key and figures.

ANASTREPHA MONTEI Costa Lima

(Fig. 10, C; pl. 11, B)

Anastrepha montei Costa Lima, Inst. Oswaldo Cruz Mem. 2S: 541, figs. 43-44, pl. 72, fig. 41, pl. 76, fig. 6S, 1934.

Rather small to medium sized, yellow brown. Mesonotum 3.2-3.5 mm. long, yellow brown, with paler yellow pattern consisting of a median stripe expanded before scutellum, humerus, lateral stripe from transverse suture to scutellum, and scutellum; stripe on mesopleuron below notopleuron, and metapleuron, pale yellow; metanotum orange brown. Macrochaetae brownish black; pile pale yellowish brown. No sternopleural bristle. Wing 7.2-7.9 mm. long, the bands yellow brown; costal and S bands connected at vein R_{4+5} ; V band narrow, often broken above, separated from or narrowly connected to S band; apex of vein M_{1+2} extending forward to apex of S band. *Female terminalia*: Ovipositor sheath 2.2-2.6 mm. long, swollen basally, the spiracles 0.67-0.75 mm. from base. Rasper of slender, curved hooks in about three rows. Ovipositor 1.5-1.9 mm. long, tapering from the considerably thickened base to the very slender apex; tip extremely short (about 0.035 mm.), with a few minute serrations. *Male terminalia*: Tergal ratio about 0.76; clasper about 0.26 mm. long, stout basally, flattened apically, tapering rather evenly to the subacute apex; teeth small, slightly proximad of middle.

Type material.—Cotypes, females and males (Instituto Oswaldo Cruz, Instituto Biologia Vegetal, and United States National Museum).

Type localities.—Brazil: Belo Horizonte, Estado do Rio; Guaratiba, Distrito Federal.

Distribution.—Costa Rica, Panama, Brazil, and Paraguay.

Food plant.—*Manihot dulcis* and *M. esculenta*.

The above description is based on two cotypes, a specimen from S. Bernardino, Paraguay (Fiebrig), six specimens from Higuaito, San Mateo, Costa Rica (Schild), a number reared from *Manihot esculenta* by James Zetek at Capira, Panama, and several trapped by Mr. Zetek at Balboa, Canal Zone, and La Campana, Panama. The larvae live in the seed capsules of the food plant.

ANASTREPHA PANAMENSIS Greene

(Fig. 10, D; pl. 11, C)

Anastrepha panamensis Greene, Wash. Ent. Soc. Proc. 36: 150, pl. 20, fig. 8, 1934.

Rather small to medium sized, orange brown. Mesonotum 3.0-3.9 mm. long, orange brown, the humerus, a rather broad median stripe expanding before scutellum to include the dorsocentral bristles, lateral stripe from transverse suture to scutellum, and scutellum pale yellow; pleura orange brown, the upper portions of meso- and sternopleuron, region below wing base, and metapleuron pale yellow; metanotum entirely orange brown. Macrochaetae black; pile orange brown. Sternopleural bristle absent or slender. Wing 6.5-7.9 mm.

long, the bands mostly yellow brown; costal and S bands rather broadly connected and hyaline costal area not reaching vein R_{4+5} , or only narrowly so; V band complete, separated from S band. Vein M_{1+2} scarcely turned forward at apex. *Female terminalia*: Ovipositor sheath 3.25–4.0 mm. long, tapering to a rather slender apex, the spiracles about 0.9 mm. from base. Rasper of rather slender hooks in two or three rows. Ovipositor 2.8–3.6 mm. long, very slender, the extreme base abruptly widened, the tip slightly widened, very short (about 0.055 mm.), abruptly tapering, with no serrations. *Male terminalia*: Tergal ratio about 0.87; clasper minute and fused to the anal segment for a greater distance than usual, so that length on inner margin is only 0.13 mm.; outer margin with a small lateral notch at base of the flattened, sharply pointed, apical portion; teeth near base of inner margin.

Type material.—Holotype female, allotype, and paratypes (United States National Museum).

Type locality.—Barro Colorado Island, Canal Zone.

Distribution.—Panama.

Food plants.—*Chrysophyllum panamense* and *C. cainito*.

The species has been reared a number of times at the type locality and once at Chorrera, Panama, and has also been trapped at La Campana, Panama, by James Zetek.

The character of the ovipositor readily distinguishes the female of this species from all other known species.

ANASTREPHA RAMOSA, new species

(Fig. 11, A; pl. 11, D)

Rather large, yellow orange. Mesonotum 3.9–4.1 mm. long, yellow orange, the humerus, a lateral stripe from transverse suture to scutellum, an indistinct median stripe widening posteriorly to include acrostichal bristles, and scutellum pale yellow; a transverse median black spot on scutoscuteellar suture; pleura yellow to yellow orange; metanotum entirely yellow orange. Macrochaetae black; pile yellow brown. Sternopleural bristle slender. Wing 9.24–9.5 mm. long, the bands orange and brown; costal and S bands narrowly connected at vein R_{4+5} ; V band complete, joined to S band, the distal arm distinctly narrower

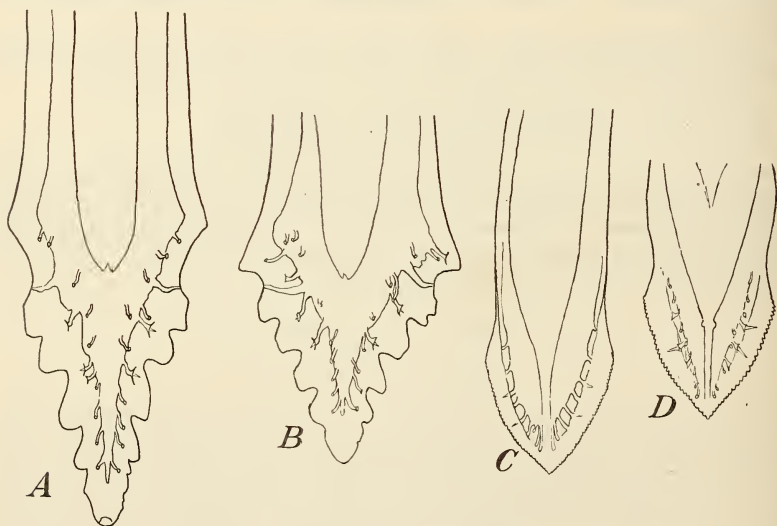
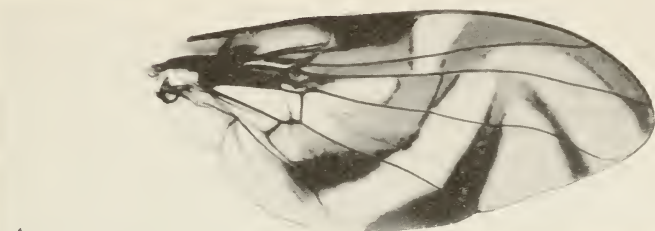


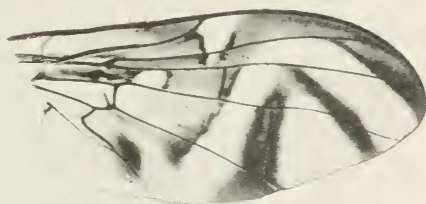
FIGURE 11.—Ovipositor tip of (A) *Anastrepha ramosa*, (B) *A. subramosa*, (C) *A. spatulata*, and (D) *A. interrupta*.



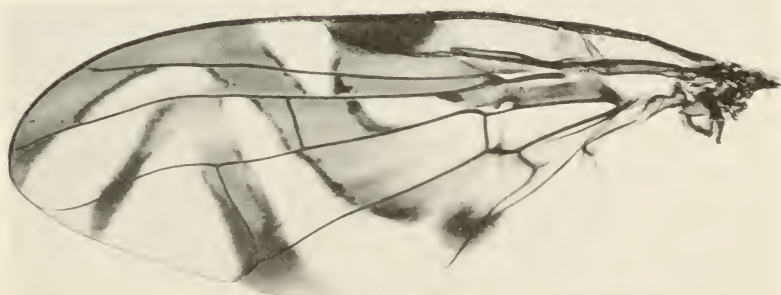
A



B

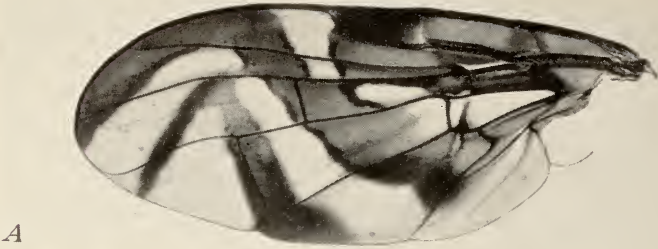


C

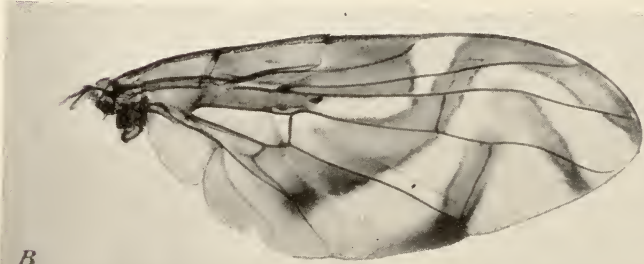


D

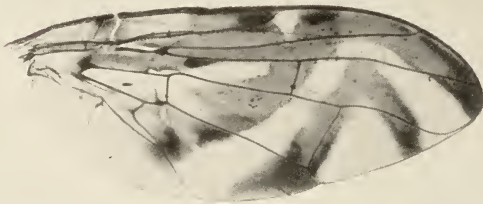
Wing of (A) *Anastrepha palae*, (B) *A. montei*, (C) *A. panamensis*, and (D) *A. ramosa*.



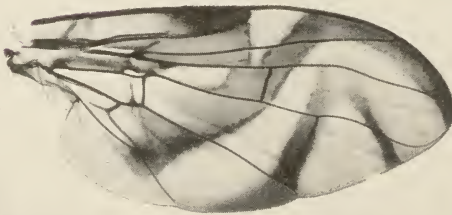
A



B



C



D

Wing of (A) *Anastrepha subramosa*, (B) *A. spatulata*, (C) *A. interrupta*, and (D) *A. pickeli*.

than the proximal arm. *Female terminalia*: Ovipositor sheath 6.45–6.9 mm. long, tapering from base to apex, the spiracles 1.95 mm. from base. In the paratype the sheath is sharply bent laterally, near middle, obviously a deformity. Rasper of rather short, stout hooks in five or six rows. Ovipositor 6.0–6.55 mm. long, moderately slender, the base only slightly widened, the tip flaring at level of end of oviduct, followed by a few large serrations.

Type material.—Holotype female and paratype female (United States National Museum No. 53906).

Type locality.—El Cermeño, Panama.

Distribution.—Panama.

Food plant.—Unknown.

The holotype was trapped July 5 and the paratype May 23, 1939, by James Zetek, the latter at La Campana.

The peculiarly shaped ovipositor tip easily distinguishes *ramosa* from all other known species except *subramosa*, which has a much shorter ovipositor. If the black spot on the thorax is constant, this would be of aid in recognizing the males of these two species, and the length of the aedeagus would probably indicate to which species any male so marked belongs.

ANASTREPHIA SUBRAMOSA, new species

(Fig. 11, B; pl. 12, A)

Medium sized, yellow orange. Mesonotum 3.6 mm. long, yellow orange, a lateral stripe from transverse suture to scutellum, an indistinct median stripe widening posteriorly to include acrostichal bristles, and scutellum pale yellow; a transverse median black spot on scutoscutellar suture; pleura yellow to yellow orange; metanotum entirely yellow orange. Macrochaetae black; pile yellow brown. Sternopleural bristle rather slender. Wing 8.0 mm. long, the bands orange and brown; costal and S bands narrowly connected at vein R_{4+5} ; V band complete, narrowly joined to S band, the distal arm distinctly narrower than the proximal arm. *Female terminalia*: Ovipositor sheath 3.73 mm. long, tapering from base to apical third, the spiracles 1.3 mm. from base. Rasper of rather short, stout hooks in five or six rows. Ovipositor 3.4 mm. long, rather stout, the base scarcely widened, the tip flaring at level of end of oviduct, followed by a few large serrations.

Type material.—Holotype female (United States National Museum No. 53907).

Type locality.—La Campana, Panama.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

The holotype was trapped June 5, 1939, by James Zetek. It closely resembles *ramosa*, new species, except in being somewhat smaller and in having a considerably shorter ovipositor sheath and a shorter and somewhat stouter ovipositor. While it is possible that they are conspecific, so wide a variation in the length of the ovipositor has not been observed in any other species.

ANASTREPHIA SPATULATA, new species

(Fig. 11, C; pl. 12, B)

Rather small to medium sized, orange brown. Mesonotum 2.5–3.4 mm. long, orange brown, the humerus, lateral stripe from transverse suture to scutellum, scutellum, and a very faintly indicated median stripe yellow; a small, subquadrate, sharply defined, median black spot on scutoscutellar suture; pleura yellow brown; metanotum orange brown. Macrochaetae coppery brown; pile

yellow. Sternopleural bristle present but rather slender. Wing 6.0–7.9 mm. long, the bands orange brown; costal and S bands narrowly connected, just touching, or occasionally narrowly separated at vein R_{1+5} ; V band complete, separated from S band; vein M_{1+2} turned forward at apex, nearly reaching apex of S band. *Female terminalia*: Ovipositor sheath 1.5–1.7 mm. long, stout, the spiracles 0.6–0.7 mm. from base. Rasper of rather small hooks in three rows. Ovipositor 1.1–1.2 mm. long, very stout, the tip short and broad with many fine serrations as shown in figure 11, C; base of ovipositor distinctly widened. *Male terminalia*: Tergal ratio about 0.67; clasper about 0.28 mm. long, stout basally, flattened apically, the apical portion tapering to an acute apex; lateral margin of apical portion shallowly concave; teeth about at middle.

Type material.—Holotype female (United States National Museum No. 53908); paratypes, 49 females, 50 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—Hacienda Santa Engracia, Tamaulipas, Mexico.

Distribution.—Rio Grande Valley in Texas, Tamaulipas and Baja California, Mexico, and Panama.

Food plant.—Unknown.

The holotype and paratypes were trapped at the type locality by C. C. Plummer. In addition to these specimens, a large number from the type locality have been seen. The species has been trapped extensively in the Rio Grande Valley in Texas from September to May, the peak of abundance being in January, and eight specimens have been trapped at La Campana, Panama, from October to January, and four at El Cermeño, Panama, in December, March, April, and May by James Zetek. A single specimen was collected by A. E. Michelbacher and E. S. Ross, of the University of California, at San Miguel, near Comondú, Baja California, in 1938. This was collected and a number of others seen on the leaves of an orange tree.

The only species resembling this one is *interrupta*, new species, which can be distinguished as indicated under that species. The name of this species is Baker's manuscript name given in reference to the broad ovipositor tip.

ANASTREPHA INTERRUPTA, new species

(Fig. 11, D; pl. 12, C)

Anastrepha, n. sp. "E." Brown, Fla. State Pl. Bd. Bien. Rpt. 11:20, 1937.

This species agrees so closely with the preceding one (*spatulata*) that it will be necessary only to indicate the differences. The hyaline spot on the costa beyond the stigma is usually confined to the anterior half of cell R_1 , only occasionally touching vein R_{2+3} . There is a tendency for the black scutoscuteellar spot to be larger than it is in *spatulata*.

Type material.—Holotype female (United States National Museum No. 53909); paratypes, 24 females, 14 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—Jensen, Fla.

Distribution.—Florida, from Micco, Brevard County, and St. James City, Lee County, to Key West.

Food plant.—Unknown. In experimental cages the species failed to oviposit on *Mimusops*, pigeon plums, papinao pods, *Solanum*, and guavas.

The holotype was trapped by Ludlum and Roberts in a guava tree, March 17, 1936. All the paratypes were trapped at various localities between December 30 and March 16, except the one from Key West, trapped on August 9.

This species is very closely related to *spatulata*, but the difference in the wing pattern is so constant that there is no difficulty in distinguishing it. In addition, the two species occupy widely separated ranges having no endemic species in common.

ANASTREPHA PICKELI Costa Lima

(Fig. 12, A: pl. 12, D)

Anastrepha pickeli Costa Lima, Inst. Oswaldo Cruz Mem. 28: 542, figs. 45-46, pl. 72, fig. 42, pl. 76, fig. 73, 1934; O Campo 8 (90): 34, 1937.

Rather small, yellow brown. Mesonotum 2.7-3.2 mm. long, yellow brown, a median stripe expanding posteriorly, humerus, lateral stripes from transverse suture to scutellum, and scutellum pale yellow; pleura with pale-yellow stripe above; no black on metanotum. Macrochaetae black, pile pale yellowish. Sternopleural bristle very weak or absent. Wing 6.25-6.9 mm. long, the bands yellow brown; costal and S bands more or less coalescent or occasionally narrowly disconnected; V band separated from S band and occasionally indistinct anteriorly. *Female terminalia*: Ovipositor sheath 1.5-1.8 mm. long, the spiracles about 0.6 mm. from base. Rasper well developed, the hooks in four or five rows. Ovipositor 1.22-1.5 mm. long, the tip serrate laterally and shaft gradually tapering from base to beginning of serrate portion. *Male terminalia*: Tergal ratio 1.0 or slightly less; clasper about 0.22 mm. long, the base moderate in thickness, the apical portion flattened, tapering to a narrow apex; teeth about at middle.

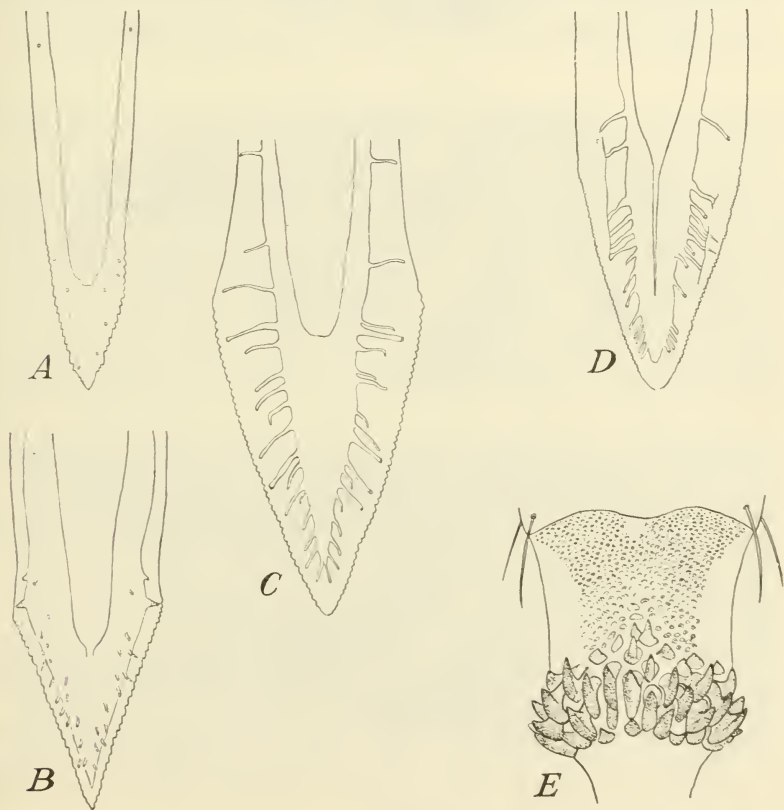


FIGURE 12.—Ovipositor tip of (A) *Anastrepha pickeli*, (B) *A. manihoti*, (C) *A. rheediae*, and (D) *A. passiflorae*; (E) rasper of *A. rheediae*

Type material.—Cotypes, females and males (Instituto Oswaldo Cruz and Instituto Biologia Vegetal, Rio de Janeiro, collection of D. Bento Pickel, and United States National Museum).

Cotype localities.—Brazil: Tapera, Pernambuco; State of Rio; Guaratiba, Federal District.

Distribution.—Brazil, Venezuela, and Panama.

Food plant.—*Manihot dulcis*, *M. esculenta*, and *Quararibea turbinata*.

The preceding description is based upon a female cotype from Guaratiba, Brazil, and a large number of specimens from Panama. The latter were reared from the flowerheads and seed capsules of *Manihot esculenta* by Ignacio Molino, Jr., at Culebra, Canal Zone, in December 1923 and by James Zetek at Capira, Panama, in December 1937. Additional material has been reared at Frijoles, Canal Zone, in November and Capira, Panama, in January, and trapped at El Cermeño, Panama, in April by Zetek and reared from *Manihot esculenta* at El Valle, Venezuela, by C. H. Ballou in September. The specimens from *Quararibea* were reared by Gregorio Bondar at Bahia, Brazil.

This species bears some resemblance to one of the other *Manihot*-infesting species, *manihoti*, but differs in the shape of the ovipositor.

ANASTREPHA MANIHOTI Costa Lima, emendation

(Fig. 12, B; pl. 13, A)

Anastrepha manihoti Costa Lima, Inst. Oswaldo Cruz Mem. 28: 543, figs. 47-48, pl. 72, fig. 43, pl. 76, fig. 72, 1934.

Small to rather small, yellow. Mesonotum 2.3-2.9 mm. long; a rather indistinct, very narrow median stripe, widening posteriorly but not attaining scutellum, humerus, lateral stripe from transverse suture to scutellum, and scutellum pale yellow; metanotum yellow orange. Macrochaetae dark brown; pile pale yellow. No sternopleural bristle. Wing 6.0-7.0 mm. long, the bands yellow and brownish; costal and S bands connected for some distance along vein R_{4+5} ; V band complete but usually faint anteriorly, usually separated from S band. *Female terminalia*: Ovipositor 1.75-1.85 mm. long, rather stout, tapering to apex, the spiracles about 0.65 mm. from base. Rasper a triangular patch of rather small hooks in four or five rows. Ovipositor 1.5-1.66 mm. long, stout, the extreme base only slightly wider than rest of shaft; tip about 0.096 mm. long, slightly widened just basad of end of oviduct and then tapering to an acute apex, with very minute serrations from lateral angle to apex. *Male terminalia*: Tergal ratio about 0.72; clasper about 0.33 mm. long, the base stout, apical portion flattened, the apex rounded; teeth about at middle.

Type material.—Cotypes, female and male (Instituto Oswaldo Cruz).

Type locality.—Viçosa, Minas Geraes, Brazil.

Distribution.—Brazil and Panama.

Food plant.—*Manihot dulcis*.

The foregoing description is based upon two topotypes, four specimens trapped in Panama by James Zetek, and a female from "Pueblo Nuevo," August 26, 1918, with no further data.

This species is similar to the other *Manihot*-infesting species, but the ovipositor is quite different. The spelling of the specific name is here emended to conform with the proper spelling of the generic name of its host, after which it was named.



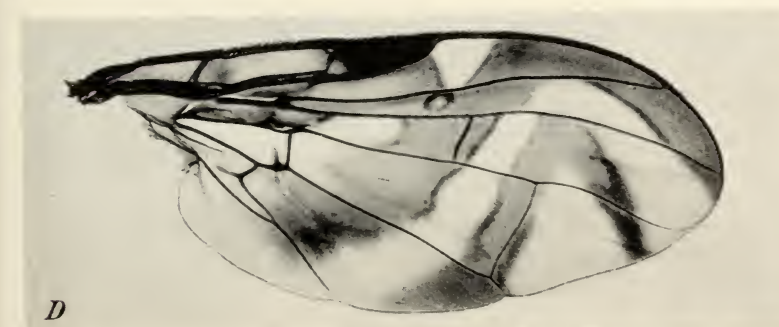
A



B

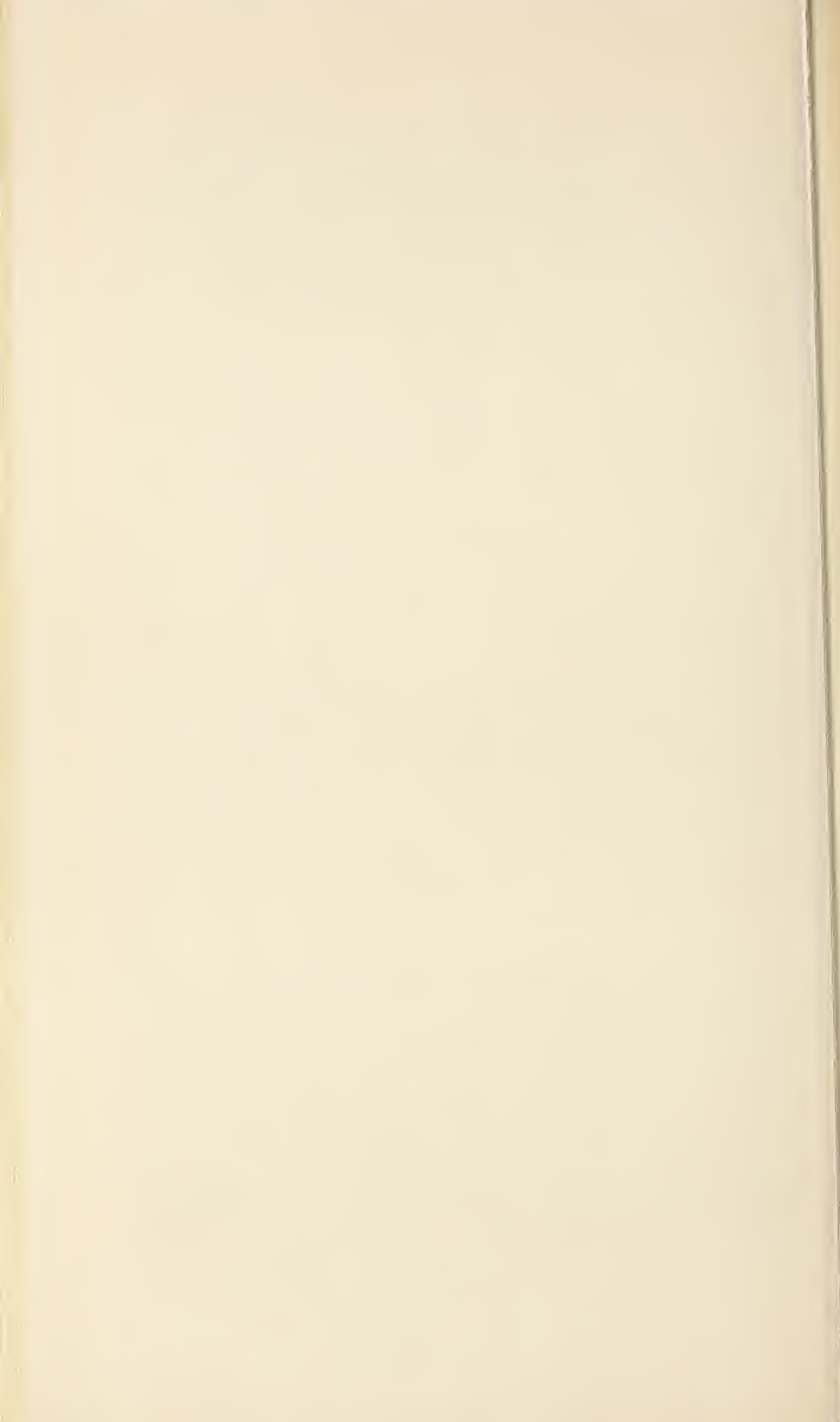


C



D

Wing of (A) *Anastrepha manihoti*, (B) *A. rheediae*, (C) *A. passiflorae*, and (D) *A. ethalea*.



ANASTREPHA RHEEDIAE, new species

(Fig. 12, *C, E*; pl. 13, *B*)

Medium sized, yellow brown; mesonotum 2.75–3.8 mm. long; humerus, median stripe expanding posteriorly, lateral stripe from transverse suture to scutellum, and scutellum pale yellow; a pale-yellow stripe on pleura above; metanotum slightly darkened laterally. Macrochaetae brownish black; pile pale, yellow brown. Sternopleural bristle weak, pale. Wing 5.6–7.9 mm. long, the bands yellow brown; costal and S bands connected on vein R_{4+5} ; V band complete and joined to S band anteriorly. *Female terminalia*: Ovipositor sheath 2.2–2.5 mm. long, tapering apically, the spiracles about 0.6 mm. from base. Rasper (fig. 12, *E*) well developed, the hooks very stout, in four or five rows, each hook with the base unusually elongate. Ovipositor 1.9–2.3 mm. long, the tip broad, with many minute lateral serrations extending basad of end of oviduct; shaft narrower than widest part of tip, somewhat widened at base. *Male terminalia*: Tergal ratio about 0.82; clasper about 0.4 mm. long, very stout basally, flattened apically, the lateral margin of apical portion slightly concave at middle; apex rather acute; teeth about at middle.

Type material.—Holotype female (United States National Museum No. 53910); paratypes, 20 females, 26 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—Barro Colorado Island, Canal Zone.

Distribution.—Panama and Trinidad.

Food plant.—*Rheedia madruno*.

The type and paratypes were all reared from *Rheedia madruno* on Barro Colorado Island by James Zetek, as follows: Type and 5 paratypes, August–September 1934; 22 paratypes, April 17, 1937; 15 paratypes, July 4–25, 1937; 4 paratypes, June 10, 1938. In addition to these there are specimens reared from *Rheedia* sp. in Trinidad, August 1917, by F. W. Urich and the species has been trapped on Barro Colorado Island, Canal Zone, and at La Campana and El Cermeño, Panama, by James Zetek.

This species may be rather readily recognized in the female by the shape of the hooks of the rasper; the ovipositor tip is much as in *lutzi*, but in *lutzi* the V band is usually separated from the S band, and there seem to be slight differences in the shape of the claspers of the male terminalia.

ANASTREPHA LUTZI Costa Lima

Anastrepha lutzi Costa Lima, Inst. Oswaldo Cruz Mem. 28: 540, fig. 42, pl. 71, fig. 40, pl. 76, fig. 71, 1934. Blanchard, Soc. Ent. Argentina Rev. 9: 41, 1937; Costa Lima, O Campo 9 (95): 61, fig. 19, pl. 7, fig. 1, 1938.

Medium sized, yellow brown. Lateral mesoscutal yellow stripes indistinct; no median stripe; metanotum entirely yellow. Macrochaetae dark brown. No sternopleural bristle. Wing 8.0 mm. long, the bands orange brown; costal and S bands just touching on vein R_{4+5} ; V band complete, separated from S band. *Female terminalia*: Ovipositor sheath 2.5 mm. long, stout. Ovipositor rather stout, the tip broad, the many fine serrations extending considerably basad of the apex of the oviduct, with a distinct angle at base of serrate portion. *Male terminalia*: Tergal ratio more than 1.0; clasper about 0.35 mm. long, rather stout, the apical portion somewhat flattened; teeth about at middle.

Type material.—Holotype female (Instituto Oswaldo Cruz).

Type locality.—Manguinhos, Rio de Janeiro, Brazil.

Distribution.—Brazil and Argentina.

Food plant.—*Passiflora* sp.

This description is based upon the original one of the female and a later one of the male by Costa Lima. He found considerable variation in the wing pattern in the later, reared specimens, the costal and S bands sometimes being separated or the V band narrowly joined to the S band. He also found the last abdominal segment of the male to be relatively longer in *lutzi* than in *pseudoparallellella*—a rather surprising condition since *pseudoparallellella* has the longer ovipositor. Blanchard reported the species from Tucuman, Argentina.

ANASTREPHA PASSIFLORAE Greene

(Fig. 12, D; pl. 13, C)

Anastrepha passiflorae Greene, Wash. Ent. Soc. Proc. 36: 151, pl. 20, fig. 9, 1934.

Medium sized to rather large, yellow brown. Mesonotum 3.2-3.8 mm. long, orange yellow, somewhat darkened in transverse band before scutellum; a rather broad median stripe widening posteriorly just to include dorsocentral bristles, humerus, a broad lateral stripe from just before transverse suture to scutellum, and scutellum pale yellow; most of pleura pale yellow; metanotum uniformly orange yellow. Macrochaetae black; pile yellow brown. No sternopleural bristle. Wing 8.0-9.25 mm. long, the bands orange brown; costal and S bands broadly joined along vein R_{4+5} ; V band complete, separated from, or narrowly joined to, S band. *Female terminalia*: Ovipositor sheath 5.5-6.0 mm. long, slender, the spiracles 1.1-1.3 mm. from base. Rasper of very many, rather slender hooks in 10 to 12 rows. Ovipositor 5.3-6.0 mm. long, slender, the base scarcely widened, the tip broad at level of end of oviduct, broadly rounded laterally with no angle, with minute serrations from opposite end of oviduct to apex. *Male terminalia*: Tergal ratio about 1.0; clasper about 0.4 mm. long, stout basally, flattened apically, and tapering rather evenly to a subacute apex; teeth about at middle.

Type material.—Holotype female, allotype, and paratypes (United States National Museum).

Type locality.—Barro Colorado Island, Canal Zone, Panama.

Distribution.—Known only from the type locality.

Food plant.—*Passiflora vitifolia*.

This species was originally reared by Ignacio Molino, Jr., and has since been reared from the food plant a number of times on Barro Colorado Island from March to July; one specimen was trapped on the island by James Zetek.

ANASTREPHA ETHALEA (Walker)

(Fig. 13, A; pl. 13, D)

Trypeta ethalea Walker, List of the Specimens of Dipterous Insects in the Collection of the British Museum, pt. 4, p. 1015, 1849.

Anastrepha ethalea (Walker): Bezzi, Portici R. Scuola Super. di Agr. Lab. Zool. Gen. e Agr. Bol. 3: 283, 285, 1909; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 532, 1934.

Medium sized, yellow brown. Mesonotum 3.4-3.9 mm. long, rather uniformly yellow brown, with no paler stripes evident; no black on metanotum. Macrochaetae orange brown; pile pale yellow. Sternopleural bristle weak. Wing 7.9-8.5 mm. long, the bands yellow brown; costal and S bands connected on vein R_{4+5} , and the hyaline area between these bands narrowed in cell R_2 ; V band completely separated from, or very narrowly connected to, S band. *Female terminalia*: Ovipositor sheath 2.7-2.9 mm. long, the spiracles about 1.0 mm. from base. Rasper well developed, the hooks in a triangular patch of five or six rows medially. Ovipositor 2.37-2.39 mm. long, the tip with many fine

serrations extending basad of apex of oviduct; shaft slightly narrowed from serrate portion to near base, the base abruptly widened. *Male terminalia*: Tergal ratio about 0.85; clasper about 0.4 mm. long, stout at base, the apical portion flattened, tapering rather evenly to a rather acute apex; teeth about at middle.

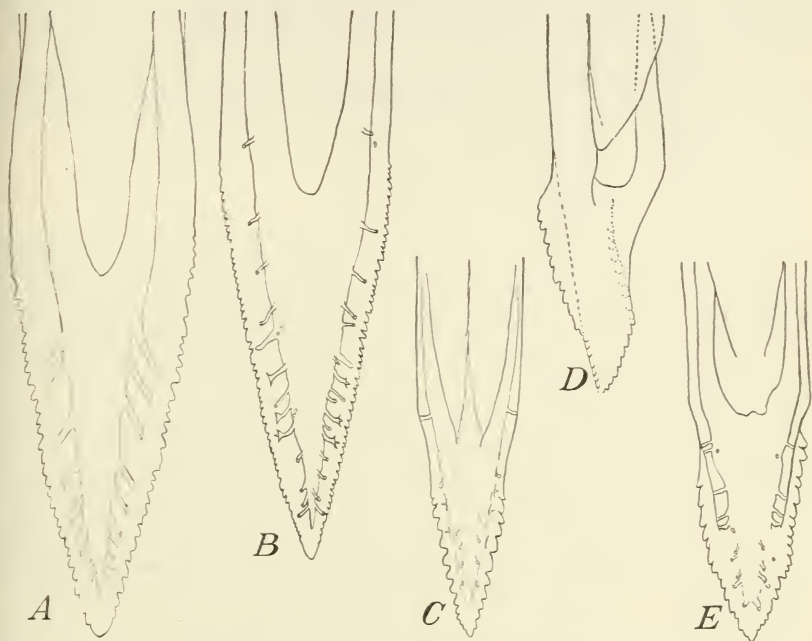


FIGURE 13.—Ovipositor tip of (A) *Anastrepha ethalea*, (B) *A. limae*, (C) *A. mombinpraeoptans*, (D) *A. compressa*, ventrolateral view, and (E) *A. compressa*.

Type material.—Holotype female (British Museum).

Type locality.—Para, Brazil.

Distribution.—Brazil and Trinidad.

Food plants.—*Passiflora quadrangularis* and *P. laurifolia*.

This description is based upon seven specimens reared from the foregoing food plants in Trinidad in August 1917 by F. W. Ulrich. A female was compared with the type by Smart.

This species is very close to *limae*, new species, but the latter has black macrochaetae and a slightly shorter ovipositor sheath. The specimens determined by Greene as *ethalea* are all *mombinpraeoptans*.

ANASTREPHA LIMAE, new species

(Fig. 13, B; pl. 14, A)

Rather small, yellow brown. Mesonotum 2.83–3.19 mm. long, yellow brown, the humerus, median stripe widening abruptly posteriorly to include acrostichal and dorsocentral bristles, lateral stripe from transverse suture to scutellum, and scutellum pale yellow; a stripe below notopleuron and entire metapleuron pale yellow; metanotum entirely yellow orange. Macrochaetae black; pile yellow brown. Sternopleural bristle very weak. Wing 6.6–7.0 mm. long, the bands yellow brown; costal and S bands just touching to rather broadly

connected on vein R_{4+5} ; V band complete, narrowly separated from S band. *Female terminalia*: Ovipositor sheath 2.0–2.3 mm. long, stout, tapering apically. Rasper of rather slender hooks in six or seven rows. Ovipositor 2.0–2.2 mm. long, rather stout, the base rather abruptly widened, the tip tapering to an acute apex, with minute serrations from slightly basad of end of oviduct to apex. *Male terminalia*: Tergal ratio about 0.86; clasper about 0.28 mm. long, the basal portion stout, apical portion flattened, the apex rather broadly rounded; teeth about at middle.

Type material.—Holotype female (United States National Museum No. 53911); paratypes, 33 females, 37 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—Panama City, Panama.

Distribution.—Panama and Texas.

Food plant.—*Passiflora quadrangularis*.

The holotype and four paratypes were reared from the food plant at Panama City, December 8, 1935, by James Zetek; the other paratypes were all reared from the same fruit at Capira, Juan Diaz, and Panama City, Panama, and Balboa, C. Z., in October, November, December, and April. Two specimens have been trapped at Harlingen, Tex., December 27, 1939, by N. O. Berry and the species has also been trapped in Panama.

This species is closely allied to *pseudoparallela*, *chiclayae*, *ethalea*, and *lutzi*. From the two former species it may be separated in the female by the fact that the serrations of the ovipositor tip extend basad of the apex of the oviduct. In *pseudoparallela* the ovipositor tip is also more elongate in relation to its width and the macrochaetae are paler; in *chiclayae* the costal and S bands are usually separated. From *ethalea* and *lutzi* it may be separated by the characters given in the key.

Since the genus already contains a species named after Dr. A. da Costa Lima, whose study of the genus has been of great value and who has helped materially in the preparation of this paper, it does not seem advisable to use a portion of his name for this species, as originally intended. It is quite appropriate, however, to use the name here given, in reference to the file-like character of the ovipositor tip.

ANASTREPHA MOMBINPRAEOPTANS Seín

The West Indian fruitfly

(Fig. 13, C; pl. 14, B)

Anastrepha fraterculus var. *mombinpraeoptans* Seín, Puerto Rico Univ. Jour. Agr. 17: 187, pl. 10, figs. 1, 4, 6–8, pl. 11, figs. 9, 10, 14–17, 19–27, pl. 12, figs. 32–37, 40, 41, pl. 13, figs. 43–51, pl. 14, figs. 52–56, 1933; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 549 and 604, figs. 52–53, pl. 73, fig. 51, pl. 76, fig. 76, 1934.

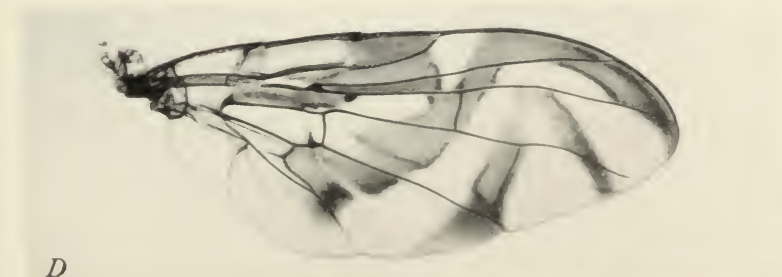
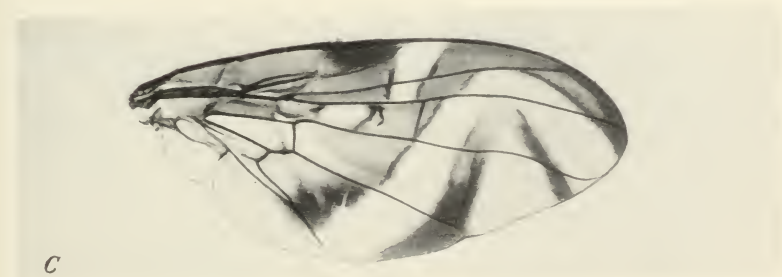
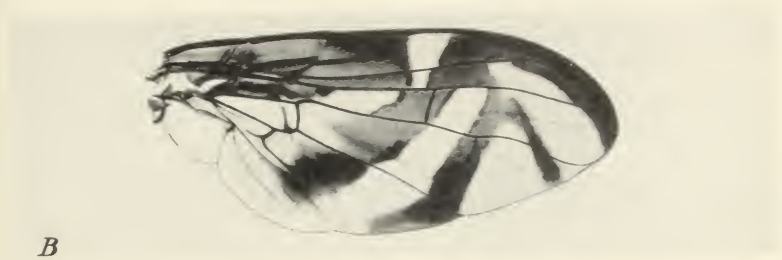
Anastrepha acidusa authors (not Walker): Bates, Brooklyn Ent. Soc. Bul. 28: 161, 1933; Greene, Wash. Ent. Soc. Proc. 36: 162, pl. 22, fig. 3, 1934; McAlister, Jour. Econ. Ent. 29: 440–445, 1936; Brown, Fla. State Plant Bd. Bien. Rpt. 11: 20, 1937.

Anastrepha trinidadensis Greene, Wash. Ent. Soc. Proc. 36: 161, pl. 22, fig. 2, 1934. (New synonymy.)

Anastrepha ethalea Greene (not Walker), Wash. Ent. Soc. Proc. 36: 161, 1934.

Anastrepha fraterculus var. *ligata* Costa Lima, Inst. Oswaldo Cruz Mem. 28: 552, fig. 54, pl. 73, fig. 52, pl. 76, fig. 75, 1934. (New synonymy.)

Rather small, yellow brown. Mesonotum 2.6–3.3 mm. long, yellow orange, a rather broad median stripe widening posteriorly, humerus and stripe back to notopleuron, lateral stripe from just before transverse suture to scutellum, and



Wing of (A) *Anastrepha limae*, (B) *A. mombinpraeoptans*, (C) *A. compressa*, and (D) *A. alveata*.



scutellum pale yellow; pleura yellow brown, a stripe below notopleuron to wing base, and metapleuron, paler; metanotum orange yellow, the sides usually somewhat darkened. Macrochaetae dark brown; pile predominantly rather dark brownish except for very pale-yellow pile of median thoracic stripe. Sternopleural bristle present, variable in thickness. Wing 5.85–7.5 mm. long, the bands yellow brown; costal and S bands touching on vein R_{4+5} ; V band complete, usually joined to S band, often broadly so; many males from Panama showing considerable diffusion of the pattern, with cell M infuscated. *Female terminalia*: Ovipositor sheath 1.6–1.9 mm. long, stout, the spiracles about 0.65 mm. from base. Rasper a triangular patch of moderately stout hooks in four or five rows. Ovipositor 1.3–1.6 mm. long, moderately stout, the base distinctly widened, the tip rather short, tapering, with rather acute serrations on the apical two-thirds or more. *Male terminalia*: Tergal ratio about 0.75; clasper about 0.35 mm. long, the base stout, the apical portion abruptly flattened, with apex rounded; teeth somewhat basad of middle.

Type material.—Holotype of *fraterculus* var. *mombinpraeoptans*, female (United States National Museum); holotype of *trinidadensis*, female (United States National Museum); cotypes of *fraterculus* var. *ligata*, females and males (Collection of the Directoria de Defesa Sanitaria Vegetal, Rio de Janeiro).

Type localities.—Of *fraterculus* var. *mombinpraeoptans*, Rio Piedras, Puerto Rico; of *trinidadensis*, Tabaquite, Trinidad; of *fraterculus* var. *ligata*, Rio de Janeiro, Brazil.

Distribution.—Throughout the Greater and Lesser Antilles, Jamaica, Trinidad, the southern tip of Florida, the Rio Grande Valley of Texas, Mexico to Panama, Venezuela, Ecuador, and the vicinity of Rio de Janeiro, Brazil.

Food plants.—*Spondias mombin*, *S. purpurea*, *S. dulcis*, *S. nigrescens*, *Mangifera indica*, *Anacardium occidentale*, *Annona hayesii*, *Dovyalis hebecarpa*, *Eugenia jambos*, *E. malaccensis*, *E. nesiotica*, *Psidium guajava*, *Averrhoa carambola*, *Prunus amygdalus* (bitter almond), *Citrus grandis*, *C. aurantium*, and *Calocarpum mammosum*. The species has also been reared experimentally in *Annona glabra* L., *Eugenia uniflora*, *Passiflora quadrangularis*, nectarine, *Chrysobalanus icaco*, *Achras zapota*, and California grape. The favored food plants are the mombins, jobos, or hog plums of the genus *Spondias*, followed by the mango, the rose-apple or pomarosa (*Eugenia jambos*), and the guava. The species occurs only rarely in *Citrus*, a few infestations having been found in grapefruit in Puerto Rico.

As indicated by the original status of the name *mombinpraeoptans* and its synonym *ligata*, this species bears a very close resemblance to *fraterculus*. However, the species may be distinguished by a number of characters which, taken together, make determination not at all difficult. These are as follows:

Anastrepha mombinpraeoptans: Pile of mesoscutum sublaterally dark brownish black, of the median stripe yellowish white, the contrast very pronounced; ovipositor always shorter than distance on vein M from base of M_2 to cross vein $r-m$; teeth of ovipositor tip rather acute; black on side of metanotum usually reduced and the inner margin of the black area not sharply defined; postscutellum not darkened laterally; wing bands usually all connected.

Anastrepha fraterculus: Pile of mesoscutum rather uniformly yellow brown, that of the sublateral stripes scarcely darker than the ground color; ovipositor always longer than distance on vein M from base of M_2 to $r-m$; teeth of ovipositor somewhat rounded; black on metanotum usually extensive, and the inner margin sharply defined; postscutellum darkened laterally; wing bands often disconnected.

The first character is rather subtle and may be seen most readily when one looks across the thorax from the side, but it has proved the

most readily usable one after a little practice in detecting it. The characters of the ovipositor are very constant but apply to one sex only, while the color of the metanotum and postscutellum is not absolutely constant.

Anastrepha suspensa (Loew) also resembles *mombinpraeoptans*, but differs from it in the same way as does *fraterculus*. Furthermore, *mombinpraeoptans* lacks the pronounced median scutoscuteellar black spot usually found in *suspensa*.

The use of the name *acidusa* for *mombinpraeoptans* arose for two reasons. In the first place, the National Museum collection contains a specimen of *mombinpraeoptans* bearing the label "compared with type of *acidusa* in the B. M., L. O. Howard." It was assumed that they had been found to be the same although Hooker (?) definitely states that Howard found the West Indian fly not to be the same. Secondly, a photograph of the wing of *acidusa* was sent to F. H. Benjamin, who considered them to be the same because the pattern was as in *mombinpraeoptans* and because the size of the wing was not given. He changed his mind later, but not before Bates had published this determination. Seín pointed out the reference by Hooker to Howard's comparison and Costa Lima used the name proposed by Seín, in his revision.

Of the 53 specimens that were included in the National Museum collection under the name *trinidadensis* Greene, 17, including the type and allotype, are *mombinpraeoptans*, the others *fraterculus*. Only the type and allotype bear type labels, and some of the others bear data not listed by Greene in his discussion of the species. The specimens determined by Greene as *ethalea* (Walker) are also *mombinpraeoptans*, *ethalea* having a considerably longer ovipositor. Costa Lima sent me specimens of his *fraterculus* var. *ligata*, and when it was suggested to him that they were the same as *mombinpraeoptans* he replied that further study had led him to the same conclusion. The National Museum collection contains a number of additional specimens from the vicinity of Rio de Janeiro. It is possible that these represent an introduction of the species at that port.

This species is the most abundant one in the West Indies and one of the most abundant ones in Panama. In Mexico the species has been reared from mangoes in the vicinity of Vera Cruz and trapped at Yau-tepec, Cuernavaca, and at the Hacienda Santa Engracia near Ciudad Victoria, Tamaulipas.

Specimens were trapped in Texas from December 8 to February 6 and from July 18 to September 17. It is possible that these came from infested fruits brought into nearby Mexico. Most of the specimens from Florida were reared from hog plums and guavas.

For a discussion of the experimental hybridization of *mombinpraeoptans* and *suspensa* see the latter species.

ANASTREPHA COMPRESSA, new species

(Fig. 13, D, E; pl. 14, C)

Rather small, yellow orange. Mesonotum 2.75-3.4 mm. long, yellow orange, with humerus, a narrow median stripe widening to include acrostichal bristles, lateral stripe from transverse suture to scutellum, and scutellum pale yellow; stripe below notopleuron, and metapleuron, pale yellow; metanotum entirely yellow orange, or narrowly darkened laterally. Macrochaetae nearly black; pile pale

yellowish brown. Sternopleural bristle rather slender. Wing 6.3–7.25 mm. long, the bands orange yellow and brown; costal and S bands touching for a short distance along vein R_{4+5} ; V band complete, separated from S band. *Female terminalia*: Ovipositor sheath 1.7–1.85 mm. long, stout, tapering apically, the spiracles about 0.7 mm. from base. Rasper of a few stout hooks in three or four rows. Ovipositor 1.5–1.6 mm. long, stout, the base distinctly widened; a distinct angle on ventrolateral surface opposite end of oviduct; serrate margin turned dorsally a short distance proximad of tip as though section of tip beyond oviduct had been pinched from below. *Male terminalia*: Tergal ratio about 0.72; clasper about 0.3 mm. long, the base stout, the apical portion flattened, tapering to a rather blunt apex; teeth about at middle.

Type material.—Holotype female (United States National Museum No. 53912): paratypes, 11 females, 4 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—La Campana, Panama.

Distribution.—Panama.

Food plant.—Unknown.

The holotype and ten paratypes were trapped at the type locality from November 28 to May 9 by James Zetek, the holotype on December 7, 1938. Three paratypes were trapped at El Cermeño, Panama, in March, June, and October and two at Balboa, C. Z., in October.

This species is closest to *canalis*, new species, but the ovipositor tip differs as indicated in the key and figures.

ANASTREPHA CANALIS, new species

(Fig. 14, B; pl. 15, A)

Small to rather small, yellow orange. Mesonotum 2.27–3.2 mm. long, the humerus, median stripe widened posteriorly to include acrostichal bristles, lateral stripe from transverse suture to scutellum, and scutellum pale yellow; pleura yellow orange and pale yellow; metanotum and postscutellum either entirely yellow orange or considerably darkened laterally. Macrochaetae dark but somewhat coppery; pile pale yellow. Sternopleural bristle medium. Wing 4.6–6.6 mm. long, the bands yellow orange and brown; costal and S bands touching; V band slender, separated from S band and frequently narrowly broken above. *Female terminalia*: Ovipositor sheath 1.45–1.77 mm. long, rather stout, tapering apically, the spiracles about 0.56 mm. from base. Rasper a rather small patch of short hooks in three or four rows. Ovipositor 1.44–1.6 mm. long, rather stout, the base distinctly widened, the tip serrate and the basal portion of the serrate margin somewhat turned upward, the serrations not extending to apex of oviduct. *Male terminalia*: Tergal ratio about 0.75; clasper about 0.26 mm. long, stout basally, flattened apically, the tip subtruncate; teeth about at middle.

Type material.—Holotype female (United States National Museum No. 53914); paratypes, 82 females, 53 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—La Campana, Panama.

Distribution.—Panama and Venezuela.

Food plant.—*Turpinia paniculata*.

The holotype and 26 paratypes were trapped in December 1937 by James Zetek; the remaining paratypes were trapped at the type locality in June and July and on Barro Colorado Island, C. Z., from May to August, and reared from the food plant on Barro Colorado Island in September, October, and November. The species occurs abundantly through the Canal Zone and adjacent Panama and two specimens were trapped at San Esteban, Venezuela, by Pablo Anduze.

This species is related to *fraterculus*, differing primarily in having a

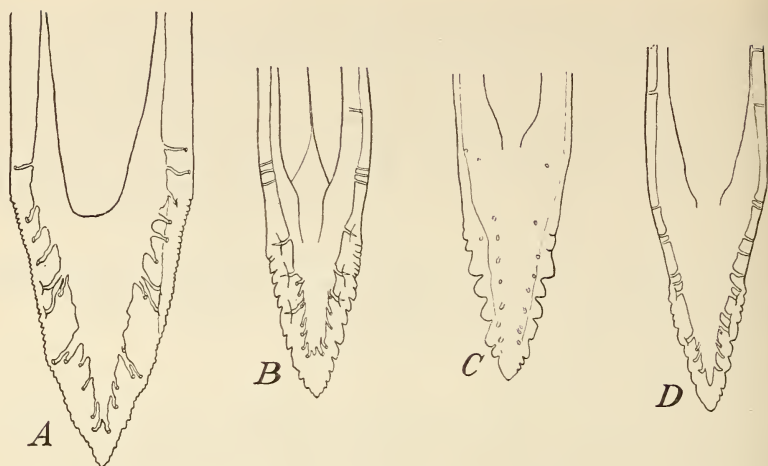


FIGURE 14.—Ovipositor tip of (A) *Anastrepha alveata*, (B) *A. canalis*, (C) *A. antunesi*, and (D) *A. suspensa*.

somewhat differently shaped ovipositor tip and in having less black on the metanotum. The male very closely resembles *distincta* but the tergal ratio is smaller and it can scarcely be distinguished from *turpiniae*, with which it is often associated in the host. The male paratypes selected were trapped in association with females and in the absence of females of *turpiniae*.

ANASTREPHA ALVEATA, new species

(Fig. 14, A; pl. 14, D)

Rather small, yellow orange. Mesonotum 2.6–3.25 mm. long, yellow orange, the humerus, narrow median stripe widening posteriorly to include acrostichal bristles but not reaching scutellum, lateral stripe from transverse suture to scutellum, and scutellum pale yellow; metanotum entirely yellow orange. Macrochaetae orange brown; pile yellow brown. Wing 6.25–6.95 mm. long, the bands yellow orange; costal and S bands touching at vein R_{4+5} ; V band complete, separated from S band, the outer margin slightly convex. *Female terminalia*: Ovipositor sheath 1.65–1.8 mm. long, stout, the spiracles 0.78 mm. from base. Rasper a small patch of 10 to 12 hooks in 3 or 4 rows. Ovipositor 1.36–1.5 mm. long, stout, the shaft narrowest just distad of the widened base, expanding posteriorly to the broad tip, the sides of which are turned upward; serrations of tip very small, extending slightly basad of the apex of the oviduct. *Male terminalia*: Tergal ratio about 0.76; clasper about 0.3 mm. long, stout basally, flattened apically, the tip narrowed to a rather acute apex; teeth about at middle.

Type material.—Holotype female (United States National Museum No. 53913); paratypes, 13 females, 23 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

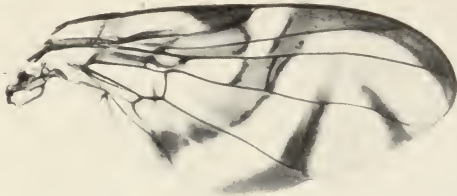
Type locality.—La Campana, Panama.

Distribution.—Panama, Venezuela, and Argentina.

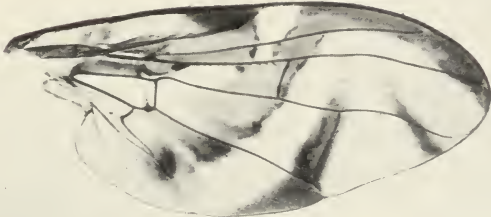
Food plant.—Myrtaceous fruit.

The holotype was trapped June 5, 1939, by James Zetek. All but two of the paratypes were trapped at Balboa, C. Z., and La Campana and El Cermeño, Panama, from May to August. The two additional paratypes were reared from a myrtaceous fruit at El Valle, Venezuela,

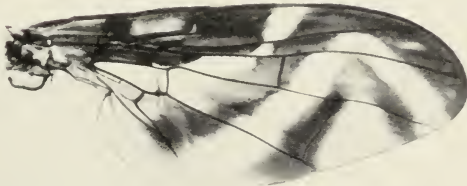
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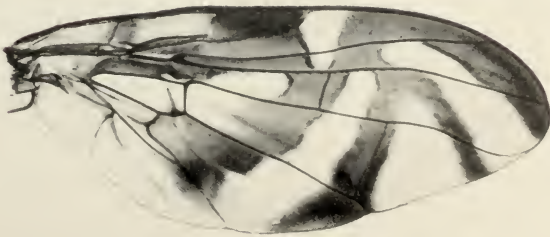
B



C



D



Wing of (A) *Anastrepha canalís*, (B) *A. antunesi*, (C) *A. suspensa*, and (D) *A. acris*.



August 23, 1938, by C. H. Ballou. In addition to this type material there is one female in the British Museum which was collected at Patquia, La Rioja Province, Argentina, by K. J. Hayward. This agrees in every detail with the Panama material save that the ovipositor does not appear to be so deeply concave dorsally and the base is not quite so abruptly widened. This may be due to pressure of the cover glass. Additional material may show this Argentine specimen to belong to a distinct species, but the distinguishing characters are too slight to permit separation at this time.

This species most nearly resembles *compressa*, having the sides of the ovipositor tip curved upward, somewhat as in that species, but the ovipositor differs in other features and the macrochaetae are of a different color.

ANASTREPHA ANTUNESI Costa Lima

(Fig. 14, C; pl. 15, B)

Anastrepha antunesi Costa Lima, O Campo 9 (1) : 63, fig. 22, pl. 5, fig. 3, pl. 6, fig. 2, 1938.

Rather small, yellow brown. Mesonotum 2.9-3.3 mm. long. Humerus, median stripe widening on scutum posteriorly, lateral stripe from transverse suture to scutellum, and scutellum pale yellow; pleura partially pale yellow; metanotum entirely yellow brown. Macrochaetae orange brown; pile pale yellow, somewhat darker on abdomen. Sternopleural bristle slender, but usually distinct. Wing 5.5-7.0 mm. long, the bands yellow brown; costal and S bands touching on vein R_{4+5} ; V band faded or broken above, separated from S band. *Female terminalia*: Ovipositor sheath 2.6-2.8 mm. long, tapering apically, the spiracles about 0.8 mm. from base. Rasper rather well developed, the hooks rather short, in a triangular patch of three or four rows. Ovipositor 2.4 mm. long, the tip with about five very coarse serrations; shaft nearly parallel-sided, the base abruptly widened. *Male terminalia*: Tergal ratio about 0.82; clasper about 0.3 mm. long, the outer margin broadly convex; basal portion stout, apical portion flattened, somewhat twisted, tapering to a moderately acute apex; teeth about at middle.

Type material.—Holotype female (Instituto Oswaldo Cruz).

Type locality.—Piraja, Bahia, Brazil.

Distribution.—Brazil, Trinidad, and Panama.

Food plants.—*Genipa americana* (type), *Spondias mombin*, *S. purpurea*, and *Spondias* sp.

The foregoing description was prepared from a long series of specimens reared from *Spondias* in or near the Canal Zone by James Zetek and in Trinidad by Alan Pickles. Others have been trapped at Balboa, C. Z., and El Cermeño and La Campana, Panama, from April to July and September to January. For some time the writer considered this material to be a species distinct from the single female type described by Costa Lima, although the only apparent difference was in the wing pattern. A study of the original photograph of the wing, sent to the writer by Dr. Costa Lima, however, shows this difference to be more apparent than real. The pattern posteriorly is faint, suggesting a somewhat teneral specimen, but the outline of the bands is quite evident in the original photograph, and the bands are not diffuse and coalescent as they appear in the published reproduction. The difference in food plants does not seem significant, these hosts being also attacked by *mombinpracoctans*. The coarsely serrate ovipositor tip is the most distinctive character of the species.

ANASTREPHA SUSPENS (Loew)

(Fig. 14, D; pl. 15, C)

Trypeta suspensa Loew, Smithsn. Inst. Misc. Collect. 6 (1) : 69, pl. 2, fig. 5, 1862.
Anastrepha suspensa (Loew): Schiner, Reise der Novara, Diptera, p. 263, 1868; Bezzi, Portici R. Scuola Super. di Agr. Lab. Zool. Gen. e Agr. Bol. 3: 284, 1909; Hendl, [Dresden] K. Zool. u. Anthrop.-Ethn. Mus. Abhandl. u. Ber. 14 (3) : 15, 1914; Bezzi, Chacaras e Quintaes 19: 374, fig. 2 (14), 1919; Bates, Brooklyn Ent. Soc. Bul. 28: 161, 1933; Greene, Wash. Ent. Soc. Proc. 36: 147, pl. 19, fig. 12, 1934; Brown, Fla. State Plant Bd. Bien. Rpt. 11: 20, 1937.

(*Trypeta*) *Acrotoxa suspensa* (Loew), Smithsn. Inst. Misc. Collect. 11 (256) : 222, 329, pl. 10, fig. 5, 1873.

Anastrepha unipuncta Sehn, Puerto Rico Univ. Jour. Agr. 17: 190, pl. 10, figs. 2, 5, pl. 11, figs. 11-13, 18, 28-31, pl. 12, figs. 38-39, 42, pl. 14, figs. 57-60, 1933; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 506, figs. 11-13, pl. 66, fig. 13, pl. 76, fig. 77, 1934.

Anastrepha longimacula Greene, Wash. Ent. Soc. Proc. 36: 146, pl. 19, fig. 11, 1934. (New synonymy.)

Small to rather small, yellow brown. Mesonotum 2.28-2.86 mm. long, yellow brown, the humerus, median stripe widening posteriorly, lateral stripe from transverse suture to scutellum, and scutellum paler; pleura yellow brown, a stripe below notopleuron and most of metapleuron paler; metanotum entirely yellow brown or darkened laterally, the dark area widest anteriorly. Macrochaetae dark brown to black; pile yellow brown. Sternopleural bristle usually rather strong. Wing 4.9-6.4 mm. long, the bands yellow brown to brown; costal and S bands touching or rather narrowly separated at vein R_{4+5} ; V band complete, usually narrowly joined to S band; in a few males cell M infuscated. *Female terminalia*: Ovipositor sheath 1.6-1.9 mm. long, stout, tapering apically, the spiracles about 0.7 mm. from base. Rasper of rather short hooks in five or six rows. Ovipositor 1.45-1.6 mm. long, stout, the base widened, the tip distinctly narrowed beyond the oviduct, serrations rather rounded, occupying apical two-thirds of tip. *Male terminalia*: Tergal ratio about 0.8; clasper about 0.3 mm. long, moderately stout basally, flattened apically, the apical portion rather narrow but the tip rounded; teeth about at middle.

Type material.—Holotype of *suspensa*, male (Museum of Comparative Zoology); holotype of *unipuncta*, female (United States National Museum); holotype of *longimacula*, female (United States National Museum).

Type localities.—Of *suspensa*, Cuba; of *unipuncta*, Rio Piedras, P. R.; of *longimacula*, Hope, Jamaica.

Distribution.—Southern Florida from St. James City and Riviera south; Cuba, Puerto Rico, Hispaniola, and Jamaica.

Food plants.—*Terminalia catappa*, *Psidium guajava*, *P. cattleianum*, *Eugenia jambos*, *E. malaccensis*, *Citrus grandis*, *C. aurantium*, *C. sinensis*, *Fortunella margarita*, *Chrysobalanus icaco*, *Spondias mombin*, *Annona reticulata*, and *Chrysophyllum cainito*. It has also been reared experimentally in Puerto Rico in black ox-heart cherries from the United States. In Puerto Rico the tropical almond, guava, and rose-apple appear to be the favored fruits.

The identity of this species has been in considerable doubt because the original figure shows cell M to be infuscated. An examination of the type specimen shows this to be true, although in all other respects the type agrees with the specimens as they are usually found, with this cell hyaline. An examination of the large accumulation of *suspensa* in the National Museum shows this cell to be infuscated in a few males from Florida, Puerto Rico, Cuba, and Jamaica, in several cases from the same rearing as normal specimens. In one

specimen cell M is infuscated in one wing, hyaline in the other. This character has been found in only a few specimens, all males, and it was Loew's misfortune to get one of these.

Because of this original figure, Seín redescribed the species under the name *unipuncta* and Costa Lima used this name, applying the name *suspensa* to another species. Greene's *longimacula* from Jamaica differs slightly from specimens from other portions of the range in that the dark scutoscuteellar spot is usually absent and the costal band is usually slightly darker than the rest of the wing pattern. The writer does not believe these differences to be significant, although it might be possible to consider *longimacula* as a Jamaican race.

In the National Museum collection are 19 specimens, the offspring of two *suspensa* females and two *mombinpraeoptans* males. The cross was made at Key West, Fla. These specimens show characters of both parents and a wing pattern with the V band rather widely separated from the S band and therefore scarcely agreeing with either. There is also a specimen reared by I. W. Berryhill at San Juan, P. R., in August 1938, which is the result of the crossing of the two species. The writer has never seen any specimens collected in the field that agreed with these hybrid specimens, and it is rather doubtful that such crossing takes place in nature.

ANASTREPHA OBLIQUA (Macquart)

Tephritis obliqua Macquart, Histoire Naturelle des Insectes, Diptères, v. 2, p. 464, 1935; Diptères Exotiques Nouveaux ou Peu Connus, v. 3, p. 225, pl. 30, fig. 11, 1843.

Trypeta obliqua (Macquart): Loew, Smithsn. Inst. Misc. Collect. 6 (1): 59 and 97, 1862. (Not *Trypeta obliqua* Say.)

(*Trypeta*) *Acrotora obliqua* (Macquart): Loew, Smithsn. Inst. Misc. Collect. 11 (256): 337, 1873.

Anastrepha obliqua (Macquart): Bezzi, Chacaras e Quintaes 19: 374, fig. 2 (6), 1919; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 52, 522, and 604, 1934; O Campo 8 (90): 37, 1937.

Yellow. Metathorax with two black spots. Wing at base, along anterior border, and in three oblique transverse bands brownish ferruginous; a hyaline spot at anterior border. Length 5 mm.

Type material.—Holotype, male according to original description, female according to Macquart's later statement. (Lille Museum?)

Type locality.—Cuba.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

The preceding description is derived from the original one. The identity of this species is so obscure that there seems to be no safe basis for recognition. The writer, through the kindness of Dr. Malachukin of the Natural History Museum of Lille, was lent two specimens, a male and a female, and permission was granted him to make such dissections as were necessary. These specimens were stated to be the types although they bore no labels whatsoever and the original description referred only to the male. They were both in wretched condition, but it was quite evident that they represented two different species. The female was dissected and mounted on three slides, and proved to be extremely close to *suspensa*. The ovipositor and as much of the wing as was present were indistinguishable from those of *suspensa*, and a faint dark spot was evident on the scutoscuteellar

suture. The male agreed in wing pattern with *munda*. Macquart's figure of 1843 shows a female with a wing pattern not as in the female received from Lille, but as in the male. Furthermore, the original description refers to a hyaline spot on the anterior border, which seems to indicate that it does not continue unbroken across the wing as it does in Macquart's figure.

Since we neither know the sex of the type nor with any certainty where it is deposited, and since Macquart's later figure combines characters of the two specimens of different species and sex, one of which is supposed to be the type, there seems no possibility of satisfactorily fixing the type specimen or applying the name.

Finally, since *obliqua* Macquart became a secondary homonym, pre-occupied by *Trypeta obliqua* Say, in 1862, when Loew placed it in the genus *Trypeta*, Macquart's name is unavailable on nomenclatorial grounds.

ANASTREPHA PERDITA, new species

(Fig. 15, A)

Rather small, yellow brown. Mesonotum 2.9 mm. long, yellow brown, the humerus, median stripe widening posteriorly, lateral stripe from transverse suture to scutellum, and scutellum yellow; pleura yellow brown and yellow; metanotum yellow orange, blackened laterally. Macrochaetae brownish (in somewhat teneral holotype) to nearly black; pile yellowish. Sternopleural bristle very weak. Wing 6.5 mm. long, the bands yellow orange, all complete and connected, the pattern as in *mombinpraeoptans*. *Female terminalia*: Ovipositor sheath 1.8–2.1 mm. long, rather stout, tapering apically, the spiracles about 0.7 mm. from base. Rasper of a few hooks in a small patch of three or four rows. Ovipositor 1.6–1.75 mm. long, rather stout, the base abruptly widened, the tip rather broad, serrate for nearly entire length.

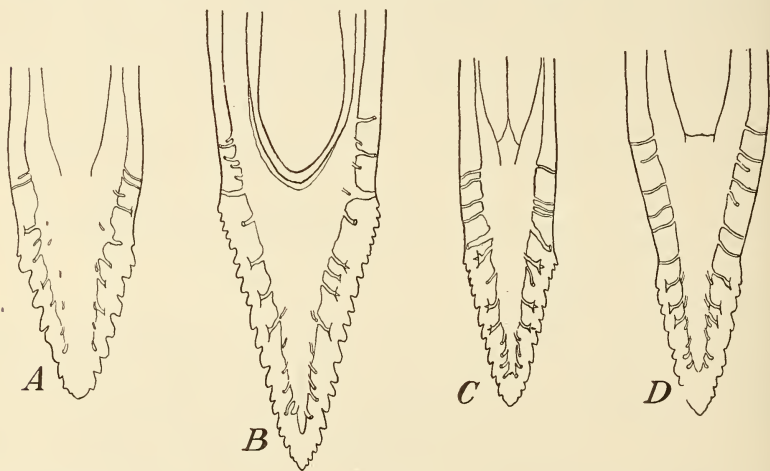


FIGURE 15.—Ovipositor tip of (A) *Anastrepha perdita*, (B), *A. acris*, (C) *A. irretita*, and (D) *A. fraterculus*.

Type material.—Holotype female (United States National Museum No. 53915), paratype female (British Museum).

Type locality.—Brazil.

Distribution.—Unknown.

Food plant.—Unknown.

The holotype was collected by George Compere in Brazil, the exact locality not being given. The paratype bears the label "S. America, H. M. S. Herald, B. M. 1860-45." Neither of the specimens is in very good condition, but since the ovipositor fails to agree with that of any similarly colored species it has been considered advisable to describe this form.

ANASTREPHA ACRIS, new species

(Fig. 15, *B*; pl. 15, *D*)

Rather small to medium sized, yellow brown. Mesonotum 2.9-3.6 mm. long, orange brown, the humerus, lateral stripe from transverse suture to scutellum, slender median stripe widening posteriorly just to include the acrostichal bristles, and scutellum pale yellow; pleura predominantly yellow; metanotum uniformly orange yellow. Macrochaetae black; pile pale yellow, somewhat darkened sublaterally on scutum. Sternopleural bristle weak or absent. Wing 6.6-8.0 mm. long, the bands orange and brownish; costal and S bands joined for a short distance along vein R_{4+5} ; V band complete, joined to S band anteriorly. *Female terminalia*: Ovipositor sheath 2.75-3.25 mm. long, rather stout, tapering posteriorly, the dorsal surface in lateral profile on basal three-fourths decidedly convex; spiracles about 1.0 mm. from base. Rasper a rather small patch of medium-sized hooks in four or five rows. Ovipositor 2.7-2.9 mm. long, rather stout, the base slightly widened, the tip rather broad, serrate, with a distinct angle at the base of the serrations, just distad of end of oviduct. *Male terminalia*: Tergal ratio about 0.75; clasper 0.45-0.5 mm. long, flattened, the outer margin slightly concave just beyond teeth, the inner margin convex nearly to tip, which is subtruncate; the teeth sub-basal.

Type material.—Holotype female (United States National Museum No. 53916); paratypes, 57 females, 18 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—Balboa, C. Z., Panama.

Distribution.—Panama.

Food plant.—Unknown.

The holotype and 70 paratypes were trapped by James Zetek at his home on Amador Road, the holotype on May 31, 1939, the paratypes from May to January. The remaining paratypes were trapped at El Cermeño, Panama, in May and June.

ANASTREPHA FISCHERI Costa Lima

Anastrepha fischeri Costa Lima, Inst. Oswaldo Cruz Mem. 28: 540, fig. 41, pl. 71, fig. 39, pl. 76, fig. 69, 1934.

Medium sized, yellow brown. Thorax yellow brown, with clear-yellow areas and stripes laterally, but with no median yellow stripe; metanotum not darkened laterally. Macrochaetae reddish. Sternopleural bristle rudimentary. Wing 7.5 mm. long, the bands yellow brown; costal and S bands narrowly connected on vein R_{4+5} ; V band complete, separated from S band. *Female terminalia*: Ovipositor sheath 2.4 mm. long. Ovipositor rather slender, the shaft about 0.065 mm. wide; tip with about 15 serrations on each side on about apical four-fifths.

Type material.—Holotype female (Instituto Oswaldo Cruz).

Type locality.—Fonseca, Nictheroy, Rio de Janeiro, Brazil.

Distribution.—Known from the type locality only.

Food plant.—Unknown.

The writer has not seen this species, the description being based upon the original one.

ANASTREPHA IRRETITA, new species

(Fig. 15, C; pl. 16, A)

Rather small to medium sized, yellow brown. Mesonotum 3.0-3.5 mm. long, yellow brown, the humerus, a slender median stripe widening posteriorly to include acrostichal bristles but not reaching scutellum, lateral stripe from transverse suture to scutellum, scutellum, and stripe below notopleuron pale yellow; metanotum entirely yellow orange. Macrochaetae black, pile pale yellow brown. Sternopleural bristle very slender to moderate in size. Wing 7.0-8.0 mm. long, the bands yellow orange to brown; costal and S bands connected narrowly on vein R_{4+5} ; V band complete, separated from, or rarely just touching, S band. *Female terminalia*: Ovipositor sheath 2.75-3.0 mm. long, tapering apically, the spiracles about 0.9 mm. from base. Rasper of relatively few, moderate-sized hooks in four or five rows. Ovipositor 2.5-2.9 mm. long, rather slender, the extreme base abruptly widened, the tip extending with nonserrate, parallel sides for some distance beyond end of oviduct and then serrate and tapering to the apex.

Type material.—Holotype female (United States National Museum No. 53917); paratypes, 24 females (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—La Campana, Panama.

Distribution.—Panama.

Food plant.—Unknown.

All the specimens were trapped by James Zetek, the holotype in December 1937. The paratypes were collected at La Campana, El Cerrito, and Capira, Panama, and Balboa, C. Z., from October to December and April to July. Males that may be of this species were also collected at the same time, but since they cannot certainly be distinguished from males of certain other species they have not been included in the type series. The shape and size of the ovipositor are the only certain diagnostic characters.

ANASTREPHA FRATERCULUS (Wiedemann)

(Fig. 15, D; pl. 16, B-D)

Dacus fraterculus Wiedemann, Aussereuropäische Zweiflügelige Insekten, v. 2, p. 524, 1830.

Trypeta unicolor Loew, Smithsn. Inst. Misc. Collect. 6 (1): 70, pl. 2, fig. 6, 1862. (*Trypeta*) *Acrotoxa fraterculus* (Wiedemann): Loew, Smithsn. Inst. Misc. Collect. 11 (256): 222, 227, 329, pl. 10, fig. 6, 1873.

Anthomyia frutalis Weyenbergh, An. de Agr., Argentina 2: 165, figs. 7-13, 1874.

Trypeta (Acrotoxa) fraterculus (Wiedemann): Berg, Com. Mus. Nac. Buenos Aires 1: 125, 1899.

Anastrepha fraterculus (Wiedemann): Van der Wulp (in part), Biologia Centrali-Americana, Diptera, v. 2, p. 404, pl. 11, fig. 21, 1899; Bezzi (in part), Portici R. Scuola Super. di Agr. Lab. Zool. Gen. e Agr. Bol. 3: 283, 286, 1909; Bréthes, Soc. Ent. de France Bul. 1914: 59, 1914; Hendel (in part), [Dresden] K. Zool. u. Anthropol.-Ethnogr. Mus. Abhandl. u. Ber. 14 (3): 14, 18, pl. 1, fig. 6, 1914; Lutz and Costa Lima, Inst. Oswaldo Cruz Mem. 10: 4-7, pl. 1, figs. 4-6, 8-9, 1918; Bezzi, Chacaras e Quintaes 19: 374, fig. 2 (11), 1919; Greene (in part), Wash. Ent. Soc. Proc. 36: 164, pl. 22, fig. 5, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 546, fig. 51, pl. 72, fig. 46, pl. 73, figs. 47-49, pl. 76, fig. 74, 1934.

Anastrepha fraterculus var. *soluta* Bezzi, Portici R. Scuola Super. di Agr. Lab. Zool. Gen. e Agr. Bol. 3: 284, 285, 1909; Lutz and Costa Lima, Inst. Oswaldo Cruz Mem. 10: 6-8, pl. 1, fig. 7, 1918; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 548, pl. 73, fig. 50, 1934; O Campo 8 (90): 34, 1937. (New synonymy.)

Anastrepha peruviana Townsend, Jour. Econ. Ent. 6: 345, 1913; Greene, Wash. Ent. Soc. Proc. 36: 148, pl. 20, fig. 1, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 553, 1934. (New synonymy.)

- Anastrepha soluta* Bezzi: Hendel, [Dresden] K. Zool. u. Anthrop.-Ethnogr. Mus. Abhandl. u. Ber. 14 (3): 13, 1914; Bezzi, Chacaras e Quintaes 19: 374, fig. 2 (7), 1919.
- Anastrepha distans* Greene (in part, not Hendel), Wash. Ent. Soc. Proc. 36: 149, pl. 20, fig. 7, 1934.
- Anastrepha braziliensis* Greene, Wash. Ent. Soc. Proc. 36: 154, pl. 20, fig. 6, 1934. (New synonymy.)
- Anastrepha trinidadensis* Greene (not Greene, in part), Wash. Ent. Soc. Proc. 36: 161, 1934.
- Anastrepha distincta* Greene (not Greene, in part), Wash. Ent. Soc. Proc. 36: 149, pl. 20, fig. 2, 1934.
- ?*Anastrepha suspensa* Costa Lima (not Loew), Inst. Oswaldo Cruz Mem. 28: 501, pl. 66, figs. 14-15, 1934.

Small to rather small, yellow brown. Mesonotum 2.75-3.3 mm. long, yellow brown, the humerus, median stripe widened posteriorly anterior to acrostichal bristles and barely including these bristles, lateral stripe from transverse suture to scutellum, and scutellum bright yellow; pleura yellow and yellow brown; metanotum and postscutellum rather broadly blackened laterally. Macrochaetae yellow brown to black; pile yellow brown. Sternopleural bristle slender. Wing 5.35-7.2 mm. long, the bands yellow orange and brown. Costal band typically touching S band and V band typically separated from S band, but the wing pattern with considerable variation as indicated in the remarks that follow and by the figures. *Female terminalia*: Ovipositor sheath 1.65-2.1 mm. long, stout, tapering apically, the spiracles about 0.7 mm. from base. Rasper a rather small patch of hooks in four or five rows. Ovipositor 1.5-1.95 mm. long, stout, the base distinctly widened, the tip narrowed beyond end of oviduct and before serrate portion, the serrations blunt and rounded, extending little more than half length of tip, sometimes less. *Male terminalia*: Tergal ratio about 0.87; clasper about 0.35 mm. long, moderately stout basally, greatly flattened apically, the apical portion somewhat narrowed, with a rather blunt apex; teeth slightly basad of middle.

Type material.—Holotype of *fraterculus*, male (Vienna Museum); holotype of *unicolor*, male (Museum of Comparative Zoology, Cambridge); of *frutalis*, cotypes of both sexes (collection unknown); holotype of *peruviana*, female (United States National Museum); of *soluta*, probably cotypes of both sexes (Bezzi Collection, Milan); holotype of *braziliensis*, female (United States National Museum).

Type localities.—Of *fraterculus*, Brazil; of *unicolor*, Colombia (New Grenada); of *frutalis*, Argentina; of *peruviana*, Chosica, Peru; of *soluta*, São Paulo, Brazil; of *braziliensis*, Viçosa, Minas Geraes, Brazil.

Distribution.—Continental America from the Rio Grande Valley of Texas to Chile and Argentina; Trinidad and Tobago.

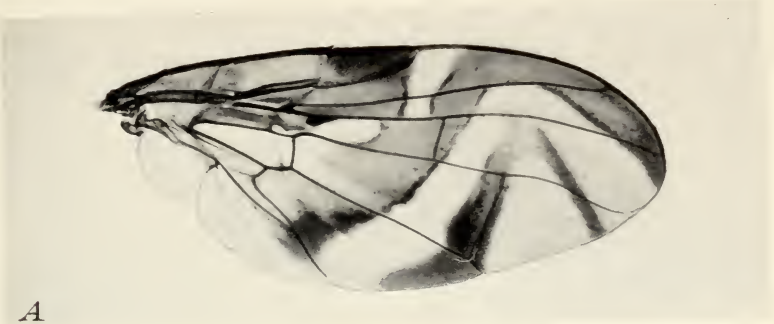
Food plants.—*Achras zapota*, *Annona cherimola*, *Eugenia jambos*, *E. malaccensis*, *Citrus grandis*, *C. sinensis*, *Coffea arabica*, *Cydonia oblonga*, *Dovyalis hebecarpa*, *Eriobotrya japonica*, *Eugenia brasiliensis*, *E. uniflora*, *Mangifera indica*, *Prunus persica*, *Psidium guajava*, *Pyrus communis*, *Spondias mombin*, *S. nigrescens*, *S. purpurea*, *Turpinia paniculata*, *Vitis vinifera*, and *Ximenia americana*. Of these food plants the Surinam cherry, peach, and guava seem to be particularly subject to attack. This species has also been reared experimentally in *Annona glabra* L., *Malus pumila* Mill., and *Phyllanthus acidus* (L.) Skeels.

It was the belief of Benjamin that the name should be applied to the species which, in this paper, is called *distincta*, and which Costa Lima named *silvai*. The writer has been able to study the type specimen of *fraterculus* through the kindness of Dr. Beier, of the Vienna Museum, and feels that this interpretation cannot be ade-

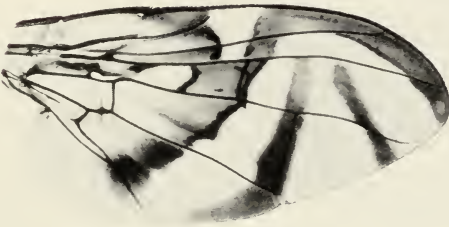
quately supported against the usual application of the name which was adopted by Costa Lima. The type bears six labels, as follows: (1) Brasilia coll. Winthem., (2) 70 (pink label), (3) *fraterculus* det. Low, (4) *D. fraterculus* Brasilia, (5) Type, (6) *A. fraterculus* Wied. (Greene's label). The specimen is unusually small for either *fraterculus* or *distincta*, the mesonotum being only 2.94 mm. long, the wing 5.94 mm. The sides of the metanotum are distinctly blackened, the macrochaetae are orange brown, a condition frequently found in *fraterculus* from Brazil, and the wing pattern is as figured by Greene except that the apex of the V band is paler. The writer can find nothing to prevent the type from being the species recognized by Costa Lima as *fraterculus*, while the tergal ratio of 0.82 is unusually low for *distincta*. The males of the two species, as they occur in Brazil, are extremely difficult to separate, and until more satisfactory characters can be found to separate them, and these demonstrated in the type, the writer prefers to accept the current interpretation of the species.

As may be deduced from the synonymy which precedes the description, this species is both an abundant and a variable one. As treated here, it extends from the Rio Grande Valley in Texas south to Argentina, and it is possible that it will eventually be found to represent a complex of species rather than a single one. Specimens from the northern portion of the range (Trinidad and Panama, northward) usually have the V band connected to the S band; most South American specimens have these bands separated, and in Brazil many specimens have the costal and S bands separated and the V band broken anteriorly. The latter was named variety *soluta* by Bezzi, and this variety was accepted by Costa Lima, although in correspondence he has since written, "I am still more convinced that *soluta* is a simple variation of *fraterculus*. I examined forms which can be considered of that pseudo-variety, intergrading with those of the common *fraterculus* type, with clear or with dark ovipositor sheath." Costa Lima has noted a difference in the color of the ovipositor sheath in Brazilian material, but is convinced that it does not represent a specific difference. The writer was inclined to consider specimens with all wing bands connected as representing a valid species, but now believes that they can be considered, at most, as no more than a geographical race. The ovipositor shows no differences that the writer can detect, and the same hosts are attacked in Brazil and in Mexico. Because of this variation in wing pattern it has been necessary to key the species out in several places. There are a number of species that are close to *fraterculus* and in this portion of the genus there is the greatest difficulty in determining specific limits. The writer has segregated *turpiniae* and *canalis* as being distinct although close. It is probable that several other species will be found in the complex, and further biological work may necessitate an alteration of the concepts given here.

The writer has studied the type of *unicolor* Loew and believes that Loew was correct in considering this name to be a synonym. *Anthomyia frutalis* Weyenbergh is obviously an *Anastrepha*, and while the wing figure is poor, there is no reason to believe that the synonymy proposed by Brethes and accepted by Costa Lima and Greene is incorrect. Many specimens from Peru, including the



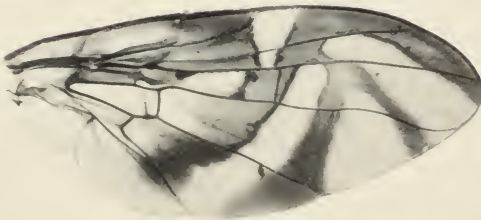
A



B



C



D

Wing of (A) *Anastrepha irretita*, (B) *A. fraterculus* (Peru), (C) *A. fraterculus* (Brazil), and (D) *A. fraterculus* (Panama).



holotype of *peruviana* Townsend, are before the writer and nothing has been found to separate them from the typical *fraterculus* of Brazil. *Anastrepha braziliensis* Greene agrees perfectly with Bezzi's variety *soluta*, the ovipositors being identical and the distinguishing characters mentioned by Greene being nonexistent or of no significance. In the key of Greene's paper, p. 137, couplet 52, *soluta* is said to have "Arms of V always connected at apex." whereas the original description of *soluta* states, "... fascia V-formi superne disjuncta atque in ramulos duos obliquos soluta." A portion of the specimens determined by Greene as *distans* Hendel, *trinidadensis* Greene, and *distincta* Greene are this species, the "male" allotype of the latter, the wing of which was figured, being a female of *fraterculus*. The specimens which Costa Lima determined as *suspensa* from Brazil are probably *fraterculus*. The writer has seen a male from Peru in which cell M was infuscated, as it is in a few males of *suspensa* and *mombinpraeoptans*, and the terminalia of two females associated with this male were as in *fraterculus*.

This species is of great economic importance because of the wide variety of plants that it attacks and its extensive distribution. The species has been trapped in abundance in Texas throughout the year, the peak of its occurrence being in January with a smaller one in August. It is least abundant in March, April, and May. Many specimens were reared from peaches and guava at Linares, Ramos Arispe, and Monterrey, Mexico. In Panama it has been reared most frequently from guava, and in the traps it is one of the three most abundant species, and often is the most abundant. In most of South America it is probably the most important of the *Anastrepha* species from an economic standpoint.

ANASTREPHA DISTANS Hendel

Anastrepha distans Hendel, [Dresden] K. Zool. u. Anthrop.-Ethn. Mus. Abhandl. u. Ber. 14(3) : 17, 1914; Bezzi, Portici R. Scuola Super. di Agr. Lab. Zool. Gen. e Agr. Bol. 13 : 5 and 11, 1919; Chacaras e Quintaes 19 : 374, fig. 2(13), 1919; Costa Lima, Inst. Oswaldo Cruz Mem. 28 : 544 and 604, 1934.

Rather large, the body length exclusive of ovipositor 9 mm. No black on side of metanotum. Wing 9.5 mm. long; costal and S bands touching along vein R_{4+5} for a greater distance than the extent of the costal hyaline spot on this vein; V band narrowly joined to S band; cross vein *r-m* distad of apex of vein R_1 .

Type material.—Holotype female (Dresden Museum).

Type locality.—Meshagua, Urubamba River, Peru.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

This species has not been recognized by the writer, and its positive identification must await a study of the ovipositor. The preceding description is based upon the original one save for the color of the metanotum, which was derived from a study of the type by Günther as reported by Costa Lima. It has been suggested that this is *fraterculus* or a variety of it, but the large size and unpatterned metanotum make this very doubtful.

The writer has studied a male from the Dresden Museum which bears a cotype label and a determination label. It is from Yungas de Corioca, 1,000 m., Bolivia, February 4, 1907. The wing is 8.6 mm.

long and the pattern and venation are as in Hendel's figure, the macrochaetae are distinctly coppery, and the sides of the metanotum are only slightly darkened. Since *distans* was described from a single female taken at a different place and date, this specimen cannot be considered a cotype and may only possibly be the same species.

ANASTREPHA ZUELANIAE, new species

(Fig. 16, A; pl. 17, A)

Rather small, yellow brown. Mesonotum 2.9–3.25 mm. long, yellow brown, the humerus, median stripe widened posteriorly to include acrostichal bristles, lateral stripe from transverse suture to scutellum, and scutellum yellowish white; pleura yellow brown and pale yellow; metanotum entirely yellow orange. Macrochaetae orange brown to rather dark brown; pile pale yellow. Sternopleural bristle very slender or absent. Wing 6.5–7.25 mm. long, the bands yellow orange and brown; costal and S bands touching; V band separated from S band, complete, but usually faint anteriorly. *Female terminalia*: Ovipositor sheath 1.9–2 mm. long, moderately stout, tapering apically, the spiracles about 0.65 mm. from base. Rasper a rather small patch of hooks in four or five rows. Ovipositor 1.65–1.85 mm. long, moderately stout, the base distinctly widened, the tip serrate on a little more than the apical half, with a distinct constriction basad of serrations. *Male terminalia*: Tergal ratio about 0.78; clasper about 0.3 mm. long, moderately stout basally, flattened apically, the tip subtruncate; teeth about at middle.

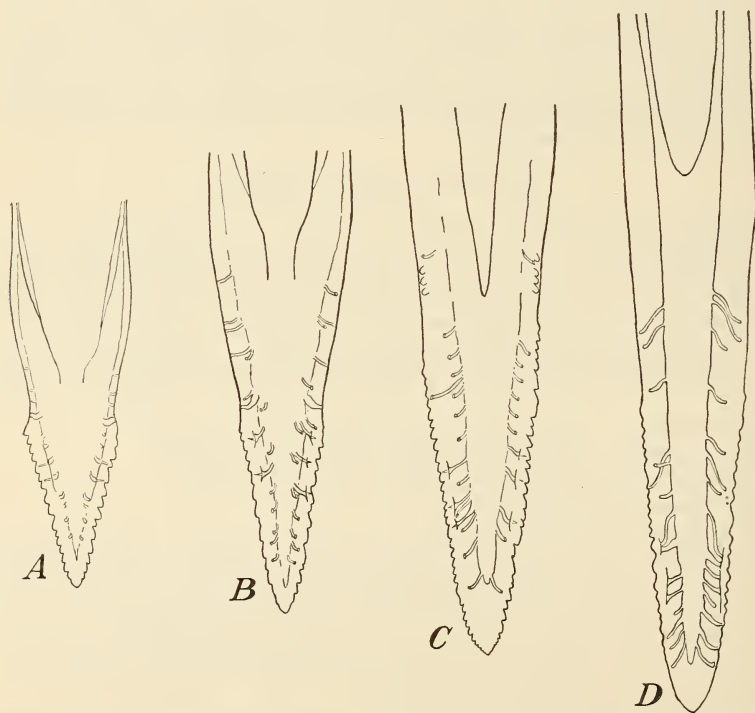


FIGURE 16.—Ovipositor tip of (A) *Anastrepha zuelaniae*, (B) *A. turpiniae*, (C) *A. pseudoparallela*, and (D) *A. townsendi*.

Type material.—Holotype female (United States National Museum No. 53918); paratypes, 44 females, 44 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—Barro Colorado Island, Canal Zone.

Distribution.—Texas to Panama.

Food plant.—*Zucclania guidonia*.

The holotype and 28 paratypes were reared from the food plant May 10-25, 1935, by James Zetek. The remaining paratypes are topotypes from the same host reared in April and May. In addition to the type series, the species has been trapped a number of times at the type locality, at Balboa, C. Z., and at Capira and La Campana, Panama, and reared experimentally from *Mungifera indica*. Seven specimens have been trapped in the Rio Grande Valley of Texas and a number at the Hacienda Santa Engracia, Tamaulipas, Mexico. The Texas specimens are typical; the Mexican specimens tend to have one or two fewer teeth on the ovipositor tip. While it is possible that the Mexican material represents a different species, the evidence at present is not sufficient to warrant the separation, and a final decision should await the rearing of the species in Tamaulipas. This species most closely resembles *turpiniae*, new species, but differs in the character of the V band and in the ovipositor tip as indicated by the key and figures.

ANASTREPHA TURPINIAE, new species

(Fig. 16, B; pl. 17, B)

Small to rather small, yellow brown. Mesonotum 2.6-3.25 mm. long, yellow brown, the humerus, median stripe widening posteriorly to include the acrostichal bristles, lateral stripe from transverse suture to scutellum, and scutellum yellowish white; pleura yellow brown and pale yellow; metanotum usually narrowly darkened laterally. Macrochaetae dark brown to nearly black; pile pale yellow. Sternopleural bristle rather slender. Wing 5.28-6.6 mm. long, the bands yellow orange and brown; costal and S bands connected at vein R_{4+5} ; V band separated from S band, the arms narrowed and usually separated anteriorly. *Female terminalia*: Ovipositor sheath 2.1-2.2 mm. long, rather stout, tapering apically, the spiracles about 0.75 mm. from base. Rasper of medium-sized hooks in five or six rows. Ovipositor 1.9-2.15 mm. long, moderately stout, the base abruptly widened, the tip rather broad opposite end of oviduct, tapering to an acute apex with the serrations on slightly more than the apical half. *Male terminalia*: Tergal ratio about 0.9; clasper about 0.27 mm. long, stout basally, flattened apically, the apical portion tapering to a slightly truncate tip; teeth slightly basad of middle.

Type material.—Holotype female (United States National Museum No. 53919); paratypes, 96 females, 47 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—Barro Colorado Island, C. Z., Panama.

Distribution.—Panama.

Food plant.—*Turpinia paniculata*.

The holotype and paratypes were all reared by James Zetek from the food plant on Barro Colorado Island during October and November of the years 1935, 1937, and 1938, the holotype having been reared November 11 or 12, 1938. Mr. Zetek has also reared the species experimentally in *Dovyalis hebecarpa* and it has been trapped at Balboa, C. Z., and La Campana, Panama, in one case in considerable numbers. It is frequently associated with *canalis*, new species, in the host.

This species belongs to the *fraterculus* complex and more nearly resembles *bahiensis* than any other species. The serrations of the ovipositor tip, however, are less extensive in *bahiensis*.

ANASTREPHA PSEUDOPARALLELA (Loew)

(Fig. 16, C; pl. 17, C)

(*Trypeta*) *Acrotoxa pseudoparallela* Loew, Smithsn. Inst. Misc. Collect. 11 (256): 230, pl. 11, fig. 24, 1873.

Anastrepha pseudoparallela (Loew): Bezzi, Portici R. Scuola Super. di Agr. Lab. Zool. Gen. e Agr. Bol. 3: 283, 1909; Hendel, [Dresden] K. Zool. u. Anthrop.-Ethnogr. Mus. Abhandl. u. Ber. 14 (3): 14, 1914; Bezzi, Portici R. Scuola Super. di Agr. Lab. Zool. Gen. e Agr. Bol. 13: 11, 1919; Chacaras e Quintaes 19: 374, fig. 2 (10), 1919; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 536, figs. 34-36, pl. 70, figs. 33-35, pl. 75, fig. 64, 1934; Greene (in part), Wash. Ent. Soc. Proc. 36: 164, pl. 22, fig. 9, 1934.

Medium sized to rather large, yellow brown. Mesonotum 3.3-3.9 mm. long, yellow orange, the humerus, lateral stripe from transverse suture to scutellum, indistinct median stripe widening posteriorly, and scutellum pale yellow; pleura predominantly yellow; metanotum entirely yellow orange. Macrochaetae brownish black; pile yellow. Sternopleural bristle very slender. Wing 8-9.2 mm. long, the bands orange brown; costal and S bands touching at vein R_{4+5} ; V band complete, separated from S band. *Female terminalia*: Ovipositor sheath 3.0-3.5 mm. long, moderately stout, tapering posteriorly, the spiracles 1.1 mm. from base. Rasper of rather long, slender hooks in five or six rows. Ovipositor 2.6-3.1 mm. long, moderately stout, the base somewhat widened, the tip long and slender, minutely serrate, with usually a few of the proximal serrations slightly in from the lateral margin. *Male terminalia*: Tergal ratio about 0.92; clasper about 0.43 mm. long, the base stout, the apical portion flattened, rather broad, with a rather blunt apex; teeth about at middle.

Type material.—Cotypes, female and male (Berlin Museum).

Type locality.—Brazil.

Distribution.—Southern Brazil.

Food plants.—*Passiflora quadrangularis*, *Psidium guajava* (?).

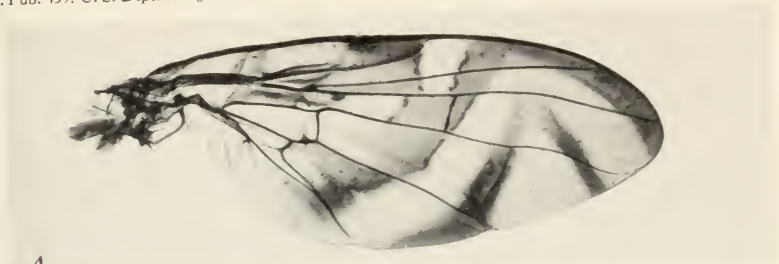
The above description is based upon four specimens in the National Museum collection and one in the British Museum. One, from São Paulo, was determined by Bezzi; two are from Rio de Janeiro, and are labelled "Reared from Guava 1926? Kisliuk and Cooley"; one is from Campinas, São Paulo, collected on passion flower by F. C. Comargo, March 1938; one, in the British Museum, was collected at Uberaba, Minas Geraes. These specimens agree with the species as recognized by Costa Lima. The ovipositor sheath is usually slightly shorter than indicated by Loew, but the determination is probably correct. The specimens from Trinidad and Bolivia determined as *pseudoparallela* by Greene are rather certainly not this species, but, being males, their identity is uncertain.

ANASTREPHA TOWNSENDI Greene

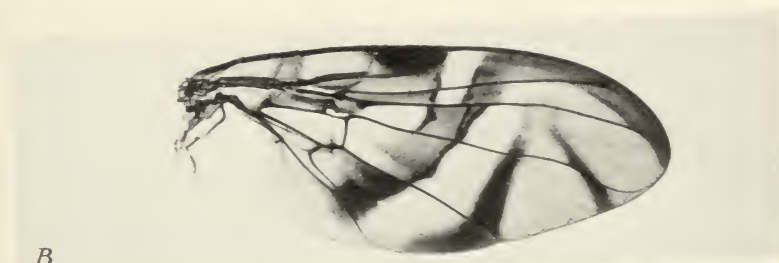
(Fig. 16, D; pl. 17, D)

Anastrepha townsendi Greene, Wash. Ent. Soc. Proc. 36: 165, pl. 22, fig. 10, 1934.

Large, orange brown. Mesonotum 4.25 mm. long, orange brown, the humerus, lateral stripe bordering transverse suture and back to scutellum, a faintly indicated median stripe widening posteriorly, and scutellum paler yellow; mesopleuron just below notopleuron yellow; metanotum entirely orange brown. Macrochaetae black; pile pale yellowish brown. Sternopleural bristle very weak, yellowish. Wing 10.5 mm. long, the bands orange yellow, partially infuscated; costal and S bands connected at vein R_{4+5} ; V band completely sep-



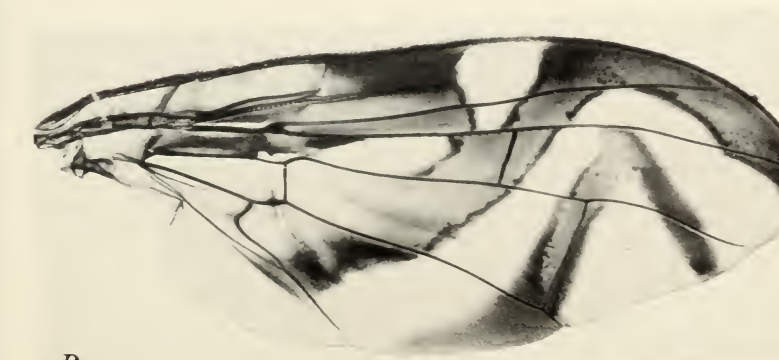
A



B



C



D

Wing of (A) *Anastrepha zuelaniae*, (B) *A. turpiniae*, (C) *A. pseudoparallela*, and (D) *A. townsendi*.

arated from S band. *Female terminalia*: Ovipositor sheath 5.5 mm. long, tapering to the slender apical half, the spiracles 1.55 mm. from base. Rasper of slender, curved hooks in four or five rows. Ovipositor 4.87 mm. long, moderately stout, the base only slightly widened, the tip rather long and slender, with coarse, indistinct serration on apical three-fifths.

Type material.—Holotype female (United States National Museum).

Type locality.—Bõa Vista, Rio Tapajos, Brazil.

Distribution.—Known from the single specimen only.

Food plant.—Unknown.

ANASTREPHA HENDELIANA Costa Lima

Anastrepha hendeliana Costa Lima, Inst. Oswaldo Cruz Mem. 28: 528, figs. 25-26, pl. 68, fig. 27, 1934.

Rather large, yellow brown, with a paler-yellow pattern as in *fraterculus*; traces of transverse dark bands on the metanotum. Macrochaetae black. Sternopleural bristle weak. Wing 9.0 mm. long, the bands dark brownish; costal and S bands joined rather broadly along vein R_{4+5} ; V band joined very broadly to S band anteriorly and in one cotype a narrow, paler connection along the fold in cell first M_2 . *Male terminalia*: Tergal ratio a little less than 1.0; clasper about 0.37 mm. long, rather slender apically, the teeth slightly proximad of middle.

Type material.—Cotypes, males (Instituto Oswaldo Cruz).

Type locality.—S. Gabriel, Rio Negro, Amazonas, Brazil.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

This species has not been seen by the writer, the preceding description being derived from the original one. The wing pattern will probably serve to permit recognition of the species.

ANASTREPHA CAUDATA, new species

(Fig. 17, A)

Rather large, yellow brown. Mesonotum 4.22 mm. long. Humerus, median stripe widening posteriorly, lateral stripes from transverse suture to scutellum, and scutellum slightly paler; metanotum entirely yellow brown. Macrochaetae black; pile yellow brown. No sternopleural bristle. Wing 9.24 mm. long, the bands brown; costal and S bands broadly joined along vein R_{4+5} ; V band joined to S band anteriorly; vein M_{1+2} extending forward to apex of S band. *Female terminalia*: Ovipositor sheath 4.3 mm. long, tapering to apical third, the spiracles about 1.44 mm. from base. Hooks of rasper few, stout, in two or three rows. Ovipositor 3.5 mm. long, the tip finely serrate, the shaft slightly widened toward base, with extreme base not abruptly widened.

Type material.—Holotype female (British Museum).

Type locality.—São Paulo, Brazil.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

The type was collected by H. W. Bates, bears the British Museum No. 1859-74, and was placed in the collection under the name *caudata* Walker. Since this appears to be a manuscript name, I am applying it to the species. It is possible that this is the female of *hendeliana*, but the somewhat larger size, entirely yellow-brown metanotum, less broadly connected V band, and lack of a sternopleural bristle in *caudata* make this association questionable, and it would seem safer to describe it as new.

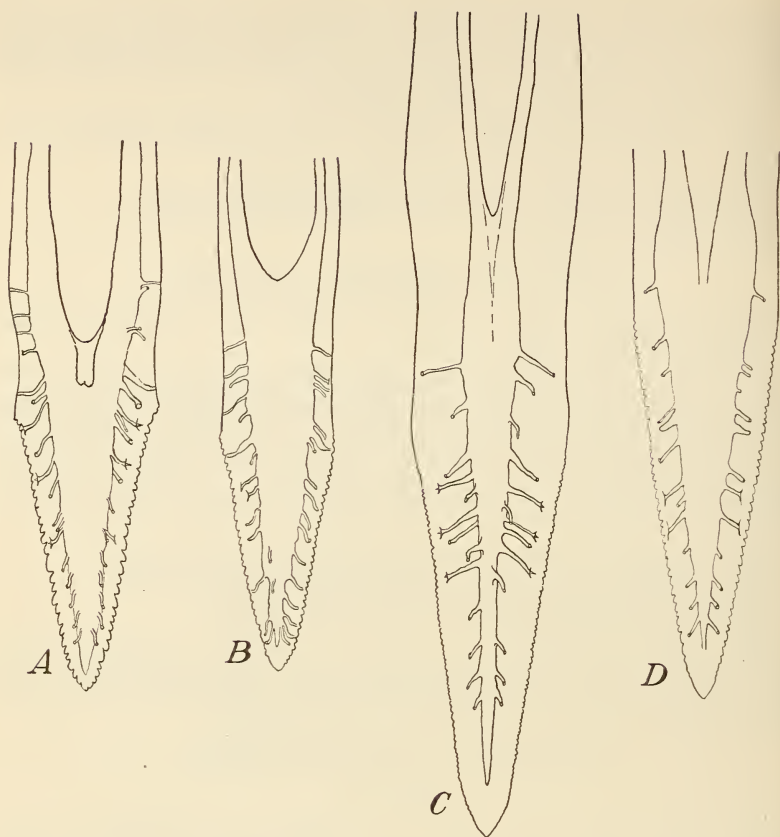


FIGURE 17.—Ovipositor tip of (A) *Anastrepha caudata*, (B) *A. duckei*, (C) *A. nigripalpus*, and (D) *A. consobrina*.

ANASTREPHA DUCKEI Costa Lima

(Fig. 17, B; pl. 18, A)

Anastrepha duckei Costa Lima, Inst. Oswaldo Cruz Mem. 28: 534, figs. 32–33, pl. 69, fig. 32, pl. 75, fig. 59, 1934.

Rather large, yellow brown. Mesonotum 3.9 mm. long. Humerus, median stripe widening posteriorly, lateral stripes from transverse suture to scutellum, and scutellum paler; pleura almost uniformly yellow brown; postscutellum somewhat blackened laterally, and sides of metanotum slightly darkened. Macrochaetae black; pile yellow orange. Sternopleural bristle very weak or absent. Wing 9 mm. long, the bands yellow brown; costal and S bands narrowly joined at vein R_{4+5} ; V band complete, not joining S band. *Female terminalia*: Ovipositor sheath 3.9 mm. long, tapering apically, the spiracles about 1.1 mm. from base. Rasper well developed, the hooks in three or four rows. Ovipositor 3.9 mm. long, stout, the tip with fine serrations starting some distance beyond end of oviduct; shaft somewhat widened at base. *Male terminalia*: Tergal ratio about 1.3; clasper about 0.25 mm. long, stout, only the extreme apical portion somewhat flattened; outer margin strongly convex to the rounded apex; teeth subapical.

Type material.—Cotypes, males and females (Secção de Entomologica Agrícola do Instituto de Biologia Vegetal, Instituto Oswaldo Cruz, and United States National Museum).

Type locality.—Manaos, Amazonas, Brazil.

Distribution.—Known only from the type locality.

Food plant.—*Ancistrothyrsus tessmannii*.

The foregoing description was made from a pair of cotypes in the United States National Museum.

ANASTREPHA NIGRIPALPUS Hendel

(Fig. 17, C)

Anastrepha nigripalpus Hendel, [Dresden] K. Zool. u. Anthrop.-Ethnog. Mus.

Abhandl. u. Ber. 14 (3): 18, 1914; Greene, Wash. Ent. Soc. Proc. 36: 156, pl. 21, fig. 6, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 526, 1934.

Large, yellow brown. Only one pair of fronto-orbital bristles; margin of palpus on apical half somewhat darkened. Mesonotum 4.5 mm. long, yellow brown, the humerus, a median stripe widening posteriorly but not attaining posterior bristles, and a lateral stripe from transverse suture to scutellum pale yellow; pleura yellow brown and yellowish; metanotum entirely yellow brown. Macrochaetae black; pile yellow. Sternopleural bristle absent. Wing 10.5 mm. long, the bands yellow orange; costal and S bands just touching on vein R_{4+5} ; V band complete, separated from S band; vein R_{2+3} slightly undulant proximad of cross vein $r-m$; vein M_{1+2} rather strongly turned forward, but not reaching apex of S band. *Female terminalia*: Ovipositor sheath 5.9 mm. long, tapering to the apical third and then slightly expanded, the spiracles 1.55 mm. from base. Rasper consisting of very many long, slender, closely set hooks in six rows. Ovipositor 5.6 mm. long, moderately slender, the extreme base abruptly widened, the tip long, with many very fine serrations on about the apical three-fifths and a distinct constriction between base of serrate portion and apex of oviduct.

Type material.—Cotypes, female and male (Vienna Museum and Dresden Museum).

Cotype localities.—San Antonio, Mapiri, Bolivia, and Urubamba River, Meshagua, Peru.

Distribution.—Known only from the cotype localities.

Food plant.—Unknown.

The foregoing description was made from the cotype female in the Vienna Museum, kindly lent the writer by Dr. Beier, with permission to mount the terminalia. The specimen resembles *consobrina*, *duckei*, and *sodalis*, new species. It differs from *consobrina* in the shape and size of the ovipositor tip and from *duckei* in having a longer ovipositor, a somewhat longer ovipositor tip, and many more hooks on the rasper. The ovipositor and rasper of *sodalis* are remarkably like those in *nigripalpus*, but the ovipositor is shorter, the serrations of the ovipositor tip are very minute, and the V band is joined to the S band in the former. The male has not been seen by the writer.

ANASTREPHA CONSOBRINA (Loew)

(Fig. 17, D; pl. 18, B)

(*Trypeta*) *Acrotoxa consobrina* Loew, Smithsn. Inst. Misc. Collect. 11 (256): 230, pl. 11, fig. 21, 1873.

Anastrepha consobrina (Loew): Bezzi, Portici R. Scuola Super. di Agr. Lab. Zool. Gen. e Agr. Bol. 3: 283, 1909; Hendel, [Dresden] K. Zool. Anthrop.-Ethnog. Mus. Abhandl. u. Ber. 14 (3): 14, 1914; Bezzi, Chacaras e Quintaes 19: 374, fig. 2 (9), 1919; Costa Lima, Inst. Oswaldo Cruz Mem. 23: 160—

162, pl. 25, figs. 5-6, 1930; Greene, Wash. Ent. Soc. Proc. 36: 167, pl. 23, fig. 7, 1934.

Anastrepha zikani Costa Lima, Inst. Oswaldo Cruz Mem. 28: 533, figs. 30-31, pl. 69, fig. 31, pl. 74, fig. 55, 1934. (New synonymy.)

Medium sized, yellow brown. Mesonotum 3.0-3.8 mm. long. Thorax yellow brown, the humerus, lateral stripe from transverse suture to scutellum, scutellum, top of mesopleuron, and metapleuron paler; no distinct median stripe on mesoscutum; metanotum entirely yellow brown. Macrochaetae orange brown to dark brown; pile pale, yellow brown. Sternopleural bristle absent or present, but slender. Wing 7.3-8.7 mm. long (9.6 as given by Loew), the bands yellow orange; costal and S bands narrowly separated or just touching; V band complete, separated from S band; vein R_{2+3} slightly undulating near apex of stigma. *Female terminalia*: Ovipositor sheath 6.7-7.0 mm. long, somewhat depressed apically, the spiracles about 1.2 mm. from base. Rasper of many long, slender hooks in eight or nine rows. Ovipositor 6.2-6.7 mm. long, moderately stout, the base only slightly widened, the tip elongate, evenly tapering, with many minute serrations. *Male terminalia*: Not seen by the writer, but, as shown by Costa Lima's figure, the claspers are about 0.38 mm. long, stout except for the flattened, blunt apex, with the teeth about at middle.

Type material.—Cotypes, female and male (collection unknown).

Type locality.—Brazil.

Distribution.—Southern Brazil.

Food plants.—*Passiflora edulis* and *P. quadrangularis*.

Costa Lima, in 1934, decided that the species reared from *Passiflora quadrangularis* at Estrella, which in 1930 he had published as *consobrina*, was not the true *consobrina*, but that a specimen collected at Itatiaia was. He redescribed the former under the name of *zikani*. This conclusion was reached by a comparison of the relative and actual dimensions of the body, ovipositor sheath, and wing of each species. While the writer has seen neither the type of *consobrina* nor the specimen from Itatiaia, he is inclined to accept Costa Lima's earlier determination as the correct one. The wing pattern of *zikani*, with the costal and S bands separated, agrees more closely with *consobrina*, and Loew particularly mentions the undulation of vein R_{2+3} in *consobrina*, which is found in *zikani*, but not in the *consobrina* of Costa Lima 1934. A study of the type would easily settle the matter, since the two species differ in the character of the ovipositor tip, the shape of the ovipositor sheath, and the position of the spiracles on the sheath. For a discussion of *consobrina* of Costa Lima 1934, see *Anastrepha amnis*, new species.

ANASTREPHA AMNIS, new species

Anastrepha consobrina Costa Lima (not Loew), Inst. Oswaldo Cruz Mem. 28: 532, fig. 29, pl. 69, fig. 30, pl. 74, fig. 54, 1934.

Rather large, length of body 7.8 mm. Wing 9.5 mm. long, the costal and S bands touching on vein R_{4+5} ; V band complete, separated from S band; vein R_{2+3} not undulant. *Female terminalia*: Ovipositor sheath 6.8 mm. long, slender, the base swollen and the spiracles close to the base. Ovipositor tip moderately elongate, serrate for the entire length.

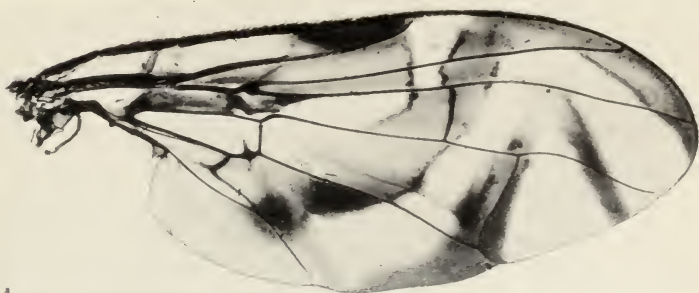
Type material.—Holotype female (Instituto Oswaldo Cruz).

Type locality.—Itatiaia, Estado de Rio, Brazil.

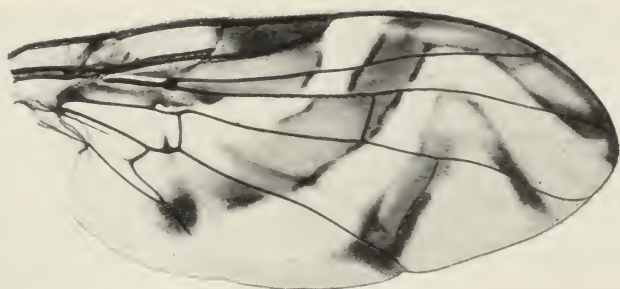
Distribution.—Known only from the type locality.

Food plant.—Unknown.

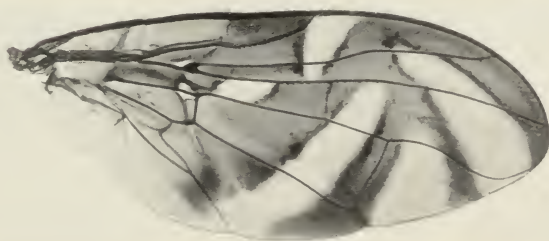
This species is based upon the single specimen, not seen by the writer, but determined and described as *Anastrepha consobrina* (Loew) by Costa Lima. As stated under *consobrina*, it is the writer's belief that this determination is incorrect and for this reason it is necessary to apply a different name to the species. It differs from



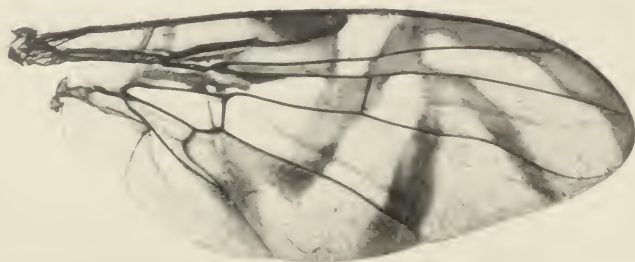
A



B



C



D

Wing of (A) *Anastrepha duckei*, (B) *A. consobrina*, (C) *A. flavipennis*, and (D) *A. robusta*.

106
an
283
p
s
sp

1

s
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v

consobrina, as recognized by the writer, in that vein R_{2+3} is not undulant, the ovipositor sheath is more slender, and the spiracles are much nearer the base, and the tip of the ovipositor is narrower and completely serrate. The length of the ovipositor sheath, originally given as 6.3 mm., was corrected to 6.8 mm. by Dr. Costa Lima in correspondence.

ANASTREPHA FLAVIPENNIS Greene

(Fig. 18, A; pl. 18, C)

Anastrepha flavipennis Greene, Wash. Ent. Soc. Proc. 36: 160, pl. 22, fig 6, 1934.

Rather small, yellow brown. Mesonotum 3.1-3.5 mm. long, with no distinct stripes; metanotum entirely yellow brown. Macrochaetae yellow brown; pile yellow. Sternopleural bristle weak. Wing 6.8-7.3 mm. long, the bands orange; costal and S bands joined along vein R_{4+5} ; V band connected to S band anteriorly; cell M yellow. *Female terminalia*: Ovipositor sheath 2.3 mm. long, stout, the spiracles about 0.95 mm. from base. Rasper well developed, the hooks stout, in a triangular patch of about five rows. Ovipositor 1.8-1.9 mm. long, the tip without lateral serrations and the apex acute; shaft nearly parallel sided to the abruptly widened base. *Male terminalia*: Tergal ratio about 0.75; clasper about 0.3 mm. long; basal portion broad, somewhat flattened, the outer margin broadly convex; a median carina on posterior surface from base to level of teeth; apical portion flattened, curved laterally and posteriorly, the apex blunt; teeth slightly distad of middle.

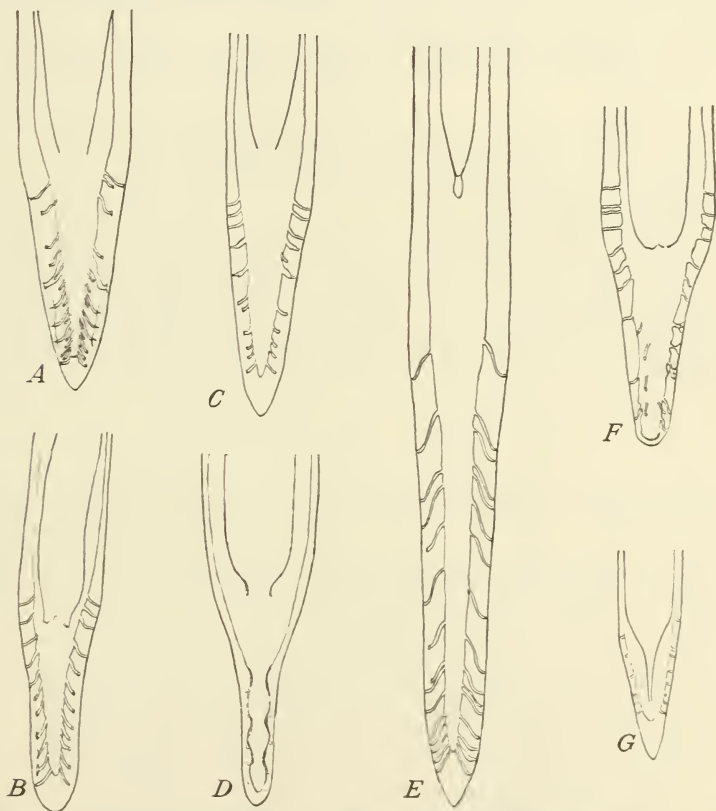


FIGURE 18.—Ovipositor tip of (A) *Anastrepha flavipennis*, (B) *A. robusta*, (C) *A. nigrifascia*, (D) *A. buscki*, (E) *A. concava*, (F) *A. fractura*, and (G) *A. zeteki*.

Type material.—Holotype female, allotype, and paratypes (United States National Museum).

Type locality.—Bôa Vista, Rio Tapajos, Brazil.

Distribution.—Brazil and Panama.

Food plant.—Unknown.

The original material of this species consists of a pair from the type locality and two males from the Canal Zone. Since then Zetek has collected the species, principally by trapping, on Barro Colorado Island, C. Z., and at La Campana, La Chorrera, El Cermeño, and Capira, Panama, at the last place in considerable abundance.

The wing pattern and body coloration will distinguish this species from all others having cell M colored, and these characters, combined with the shape of the ovipositor, from all with a hyaline cell M.

ANASTREPHA FUMIPENNIS Costa Lima

Anastrepha fumipennis Costa Lima, Inst. Oswaldo Cruz Mem. 28: 499, fig. 6, pl. 65, fig. 10, pl. 75, fig. 62, 1934.

General color orange or castaneous. Mesoscutum with sulphur-yellow stripes in the usual pattern; sides of metanotum sulphur yellow, and within these yellow lateral areas two well separated, brownish-black stripes. Wing with pattern yellowish brown; costal and S bands broadly coalescent, separated only by a hyaline costal triangle scarcely reaching vein R_{4+5} ; V band narrowly separated from S band, the apical arm reduced to a small spot near vein M_{1+2} . *Female terminalia*: Ovipositor sheath 3.5–4.0 mm. long. Teeth of rasper numerous and more or less robust. Ovipositor tip rather elongate, the apex roundedly truncate, with no serrations.

Type material.—Cotype females (Instituto Oswaldo Cruz).

Type locality.—Manguinhos, Rio de Janeiro, Brazil.

Distribution.—Known only from the type specimens.

Food plant.—Unknown.

This description is based upon the original one, the writer not having seen the species. The character of the wing pattern and ovipositor tip rather certainly separate it from the other known species. The wing pattern most closely resembles that of *bivittata*, but unless the figure of the latter is very inaccurate, it is not the same species. Also the ovipositor sheath of *bivittata* is somewhat shorter.

ANASTREPHA ROBUSTA Greene

(Fig. 18, B; pl. 18, D)

Anastrepha robusta Greene, Wash. Ent. Soc. Proc. 36: 144, pl. 19, fig. 5, 1934.

Anastrepha furcata Costa Lima (not Costa Lima), O Campo 9 (95): 64, 1938.

Medium sized to rather large, yellow orange. Mesonotum 3.8–4.2 mm. long, robust, pale yellow, with two pairs of narrowly separated yellow-orange stripes, the median pair extending from anterior margin to about posterior two-fifths of scutum, the lateral pair the entire length, broken at transverse suture; a rather shiny brown band on posterior declivity of scutum, not encroaching on scutellum; pleura pale yellow and yellow orange; metanotum entirely yellow orange. Macrochaetae black; pile yellowish brown, that on margins of scutellum and on abdomen somewhat darker. No sternopleural bristle. Wing 8.0–8.6 mm. long, the bands predominantly brown, all complete, narrowly connected; a deep notch in posterior margin of S band in cell Cu_1 ; vein M_{1+2} turned forward to meet apex of S band at wing margin. *Female terminalia*: Ovipositor sheath 2.27–2.6 mm. long, stout, strongly convex dorsally, the spiracles about 1.1 mm. from base. Rasper of about 14 rather strong hooks in three or four rows. Ovipositor 1.7–1.8 mm. long, strongly curved upward, the base expanded rather gradually, the tip slightly narrowed beyond end of oviduct, elongate, with a rather blunt

apex and no serrations. *Male terminalia*: Tergal ratio about 0.70; clasper about 0.26 mm. long, stout, the outer margin strongly convex and only the extreme tip slightly flattened; teeth subapical.

Type material.—Holotype female and allotype (United States National Museum).

Type locality.—Cayuga, Guatemala.

Distribution.—Mexico, Guatemala, Panama, and Brazil.

Food plant.—Unknown.

This description is made from the two type specimens and from 17 specimens trapped at various places in Panama by James Zetek from December to July. The Brazilian record is based upon the female from the Rio Cumina, Para, Brazil, which Costa Lima determined as his *furcata*, but which appears to agree more closely with *robusta*.

ANASTREPHA FURCATA Costa Lima

Anastrepha furcata Costa Lima, Inst. Oswaldo Cruz Mem. 28: 529, fig. 27, pl. 63, fig. 28, 1934; O Campo 8 (90): 38, 1937.

This species, known only from the male, appears to be identical with *robusta* Greene save in being slightly larger and in having vein M_{1+2} turned forward to a less extent, so that its apex is rather widely separated from the apex of the **S** band.

Type material.—Holotype male (Instituto Oswaldo Cruz).

Type locality.—Manaos, Rio Negros, Amazonas, Brazil.

Distribution.—Brazil and Panama.

Food plant.—Unknown.

The writer has not seen this species from Brazil, but a single male trapped by James Zetek at El Cermeño, Panama, June 13, 1939, appears to belong here. He was at first inclined to consider this species to be a synonym of *robusta*, particularly after learning from Dr. Costa Lima that the holotype has a dark-brown band in front of the scutellum, and after seeing a description of a female that Costa Lima thought to be of the same species. In one important feature, however, the holotype of *furcata* and the male from Panama differ from the specimens of *robusta* before the writer and the female determined as *furcata* by Costa Lima. In the former vein M_{1+2} stops considerably short of the apex of the **S** band; in the latter this vein and the **S** band meet at the wing margin. Discovery of the true female of *furcata* will probably show better characters for differentiation, but with the evidence now available it does not seem possible to consider them the same.

ANASTREPHA NIGRIFASCIA, new species

(Fig. 18, C; pl. 19, A)

Anastrepha sp. "W," Brown, Fla. State Plant Bd. Bien. Rpt. 11: 21, 1937.

Rather small, yellow brown. Mesonotum 2.93–3.57 mm. long, stout, yellow brown, the humerus, a slender median stripe widening abruptly at posterior third to include acrostichal and dorsocentral bristles, a very slender dorsocentral stripe, notopleuron, rather broad lateral stripe from transverse suture to scutellum, and scutellum pale yellow; a pronounced dark-brown band on posterior margin of mesoscutum; pleura predominantly pale yellow; metanotum entirely yellow. Macrochaetae black; pile yellow brown. Sternopleural bristle very weak. Wing 6.3–7.5 mm. long, the pattern predominantly brown; costal

and **S** bands joined at vein R_{4+5} ; **S** band reaching vein M_{1+2} apically; **V** band irregular, narrowly joined to **S** band anteriorly, but the proximal arm constricted or broken in cell R_5 . *Female terminalia*: Ovipositor sheath 2.0–2.05 mm. long, stout, tapering apically, the spiracles 0.9 mm. from base. Rasper of eight strong hooks and a number of shorter, stout projections basad of these. Ovipositor 1.6–1.7 mm. long, rather stout, the base abruptly widened, the tip tapering, with no serrations. *Male terminalia*: Tergal ratio about 0.64; clasper about 0.2 mm. long, stout, the outer margin convex, the tip turned inward over the subapical teeth.

Type material.—Holotype female (United States National Museum No. 53920); paratypes, 50 females, 60 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—Big Pine Key, Fla.

Distribution.—The Florida keys from Key Largo to Key West.

Food plants.—*Mimusops emarginata* and *Achras zapota*.

The holotype was trapped May 21, 1935, by G. B. Merrill. The paratypes were collected by the State Plant Board of Florida from Key West, Big Pine Key, Boca Chica Key, No Name Key, Sugar Loaf Key, and Cudjoe Key in January, May, and June. Many of these were reared from *Mimusops*.

This species resembles *robusta*, but the latter is larger, with a somewhat different wing pattern as indicated in the key.

ANASTREPHA PHAEOPTERA Costa Lima

Anastrepha phaeoptera Costa Lima, O Campo 8 (90): 38, fig. 9, pl. 1, fig. 3, 1937.

Rather large, yellow brown, with markings on mesoscutum, the dorsal and apical surface of scutellum, and metanotum paler yellow; side of scutellum and postscutellum darker brownish; metanotum yellow orange. Sternopleural bristle slender. Wing 9.0 mm. long, the bands predominantly dark brown; costal hyaline spot reaching vein R_{4+5} but widely separated from small hyaline spot in cell R and hyaline basal portion of cell first M_2 ; distal margin of proximal portion of **S** band with a small projection in cell first M_2 and a large notch in cell Cu_1 ; **V** band broken, the proximal arm broadly joined to **S** band, the distal arm not attaining vein R_{4+5} ; vein M_{1+2} turned forward to reach apex of **S** band. *Male terminalia*: Tergal ratio 1.0 or slightly less; clasper about 0.27 mm. long, stout, with blunt apex, the teeth subapical.

Type material.—Holotype male (Instituto Oswaldo Cruz).

Type locality.—Bahia, Brazil.

Distribution.—Known only from the type locality.

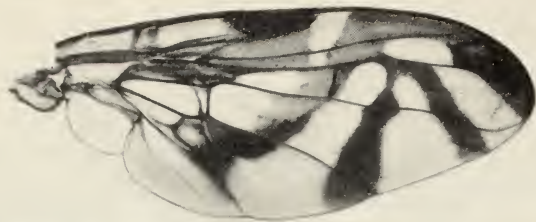
Food plant.—*Helicostylis poeppigiana*.

This species has not been seen by the writer, the description being based upon the original one. The wing coloration resembles that of *concava*, *fenestrata*, *furcata*, *robusta*, and *speciosa*, but the pattern does not agree with that of any of these, and the course of vein M_{1+2} differs from that in all but *fenestrata* and *robusta*.

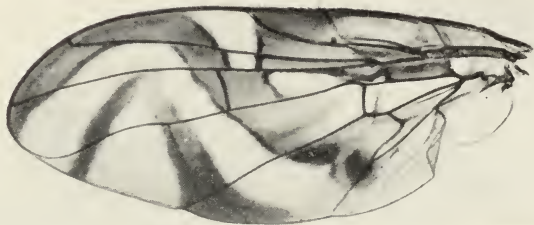
ANASTREPHA BUSCKI, new species

(Fig. 18, *D*; pl. 19, *B*)

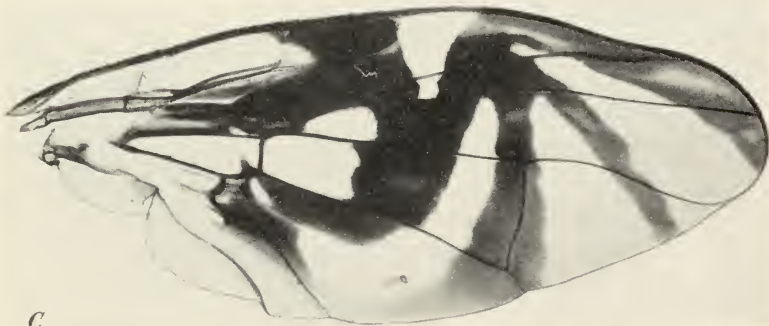
Rather small, yellow brown. Mesonotum 2.6–3.25 mm. long. Humerus, median stripe widening on scutum posteriorly, lateral stripe from transverse suture to scutellum, and scutellum pale yellow; a pale-yellow stripe below notopleuron; metanotum entirely yellow brown. Macrochaetae nearly black; pile pale, yellow brown. Sternopleural bristle weak, pale. Wing 6.0–6.9 mm.



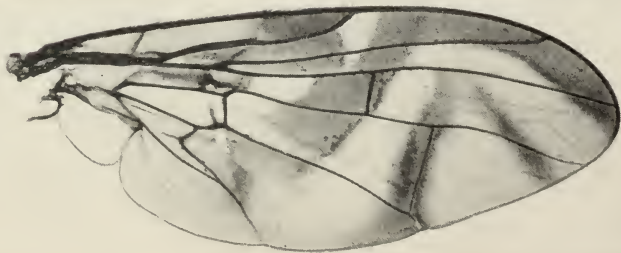
A



B

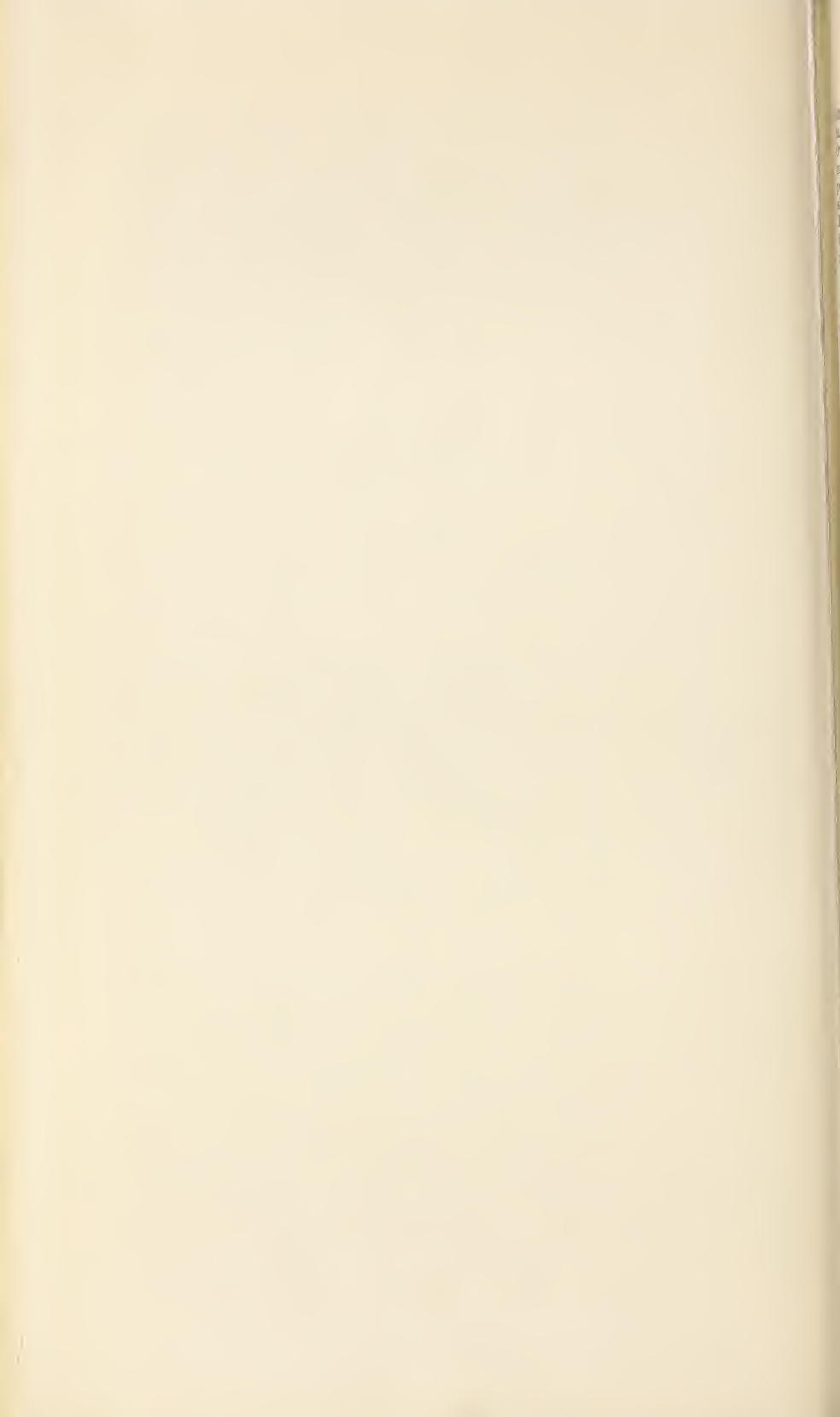


C



D

Wing of (A) *Anastrepha nigrifascia*, (B) *A. buscki*, (C) *A. concava*, and (D) *A. zetekii*



long, the bands yellow brown; costal and **S** bands connected on vein R_{4+5} ; **V** band complete and usually widely separated from **S** band. *Female terminalia*: Ovipositor sheath 2.11–2.5 mm. long, tapering apically, the spiracles about 0.7 mm. from base. Rasper well developed, the hooks in four or five rows. Ovipositor 1.69–2.0 mm. long, the tip without serrations and decidedly narrowed; shaft slightly widened toward base, but extreme base not abruptly widened. *Male terminalia*: Tergal ratio about 0.8; clasper about 0.25 mm. long, stout basally, the apical portion flattened, with the margins nearly straight to the rather acute apex; teeth about at middle.

Type material.—Holotype female (United States National Museum No. 53921); paratypes, 16 females, 6 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—Tabernilla, Canal Zone, Panama.

Distribution.—Panama.

Food plant.—Unknown.

The holotype and one male paratype were collected June 21, 1907, by August Busck, and the writer takes great pleasure in naming the species in his honor. The other paratypes were trapped at El Cermeño, Panama, from May 16 to June 27, 1939, at La Campana, Panama, May 16, 23, and 30, 1939, and at Balboa, C. Z., June 29, by James Zetek.

The peculiarly narrowed ovipositor tip combined with the body color will distinguish the female of this species.

ANASTREPHA CONCAVA Greene

(Fig. 18, *E*; pl. 19, *C*)

Anastrepha concava Greene, Wash. Ent. Soc. Proc. 36: 169, pl. 23, fig. 5, 1934.

Rather large, orange brown. Mesonotum 4.2–4.6 mm. long, uniformly orange brown; no black on metanotum. Macrochaetae black; pile orange brown. Sternopleural bristle well developed. Wing 9.9–10.5 mm. long, the bands dark brown; hyaline spot on costa extending narrowly to vein R_{4+5} ; **S** band broadly joined to costal band along vein R_{4+5} ; **V** band broadly joined to **S** band anteriorly. *Female terminalia*: Ovipositor sheath 6.6 mm. long, slender, tapering to apical half; spiracles about 1.6 mm. from base. Rasper consisting of about four rows of well developed hooks. Ovipositor 6.3 mm. long, slender, the tip long, nonserrate.

Type material.—Holotype, sex unknown (United States National Museum).

Type locality.—Close's, Caño Saddle, Canal Zone, Panama.

Distribution.—Panama and the Amazon River Valley.

Food plant.—Unknown.

The female terminalia of this species are described from two specimens, one in the British Museum collected by H. W. Bates in the Amazons, and the other in the American Museum of Natural History from Santarem, Brazil. These two specimens differ from the type in lacking the concavity on the costal margin of the wing subapically and in having a slightly wider, more regular **V** band. It is quite probable that the wing figured by Greene and in this paper is abnormal, particularly since the opposite wing of the type has a less pronounced emargination. A similar wing distortion has also been seen in other species.

ANASTREPHA CONJUNCTA Hendel

Anastrepha conjuncta Hendel, [Dresden] K. Zool. u. Anthrop.-Ethnogr. Mus. Abhandl. u. Ber. 14 (3): 17, 1914; Greene, Wash. Ent. Soc. Proc. 36: 159, 1934; Costa Lima, Inst. Oswaldo Cruz. Mem. 28: 527, 1934.

Large, yellow brown. Yellow stripes on mesoscutum as in *fraterculus*; no black on metanotum. Wing 12 mm. long, the bands all broadly connected; cross vein *r-m* slightly proximad of apex of vein *R*₁.

Type material.—Holotype male (Dresden Museum).

Type locality.—Mapiri, Bolivia.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

This species is unknown to the writer, the foregoing description being based upon the original one. Since the female is unknown it will prove difficult to recognize the species, but the large size, wing pattern, and venation are the salient features to be considered in any attempt to associate a female with it.

ANASTREPHA CONNEXA Costa Lima

Anastrepha connexa Costa Lima, Inst. Oswaldo Cruz. Mem. 28: 530, fig. 28, pl. 19, fig. 29, 1934.

Rather large. Thorax colored as in *fraterculus*, but no black on metanotum. Macrochaetae black. Sternopleural bristle absent. Wing 10 mm. long, the bands yellow, all narrowly connected. *Male terminalia*: Tergal ratio at least 1.0; clasper about 0.37 mm. long, the apex blunt; teeth about at middle; aedeagus about 4.4 mm. long.

Type material.—Holotype male (Instituto Oswaldo Cruz).

Type locality.—São Paulo, Brazil.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

The female of this species has not been certainly determined and until this association is made with certainty the species must remain unrecognized. For suggested or possible females, see *Anastrepha discessa*, new species, on page 34, and *A. sodalis*, new species, on page 102.

ANASTREPHA ZETEKI Greene

(Fig. 18, *G*; pl. 19, *D*)

Anastrepha zeteki Greene, Wash. Ent. Soc. Proc. 36: 152, pl. 20, fig. 4, 1934.

Medium sized, predominantly pale yellow. Mesonotum 2.9–3.9 mm. long, pale yellow, with yellow-orange pattern as follows: A triangular spot between humerus and transverse suture; a median pair of stripes from anterior margin to posterior fourth, well separated, divergent posteriorly, and each stripe with rounded posterior end; a lateral stripe from transverse suture to scutellum, the dorsocentral bristle on its inner margin; and a band along scutoscutellar suture connecting lateral stripes. Pleura predominantly pale yellow; metanotum orange yellow. Macrochaetae orange brown; pile pale yellow brown. Sternopleural bristle rather strong. Wing 7.0–8.5 mm. long, the bands yellow orange: costal and *S* bands joined along vein *R*₄₊₅ for a short distance; *V* band complete, usually separated from *S* band; vein *M*₂₊₃ scarcely turned forward apically. *Female terminalia*: Ovipositor sheath 8.5–10.0 mm. long (in one runt only 6 mm.), slender, the base moderately swollen, the spiracles about 1.4 mm. from base. Rasper of rather few, slender hooks in three or four rows. Ovipositor about length of sheath, slender, somewhat twisted basally, the base abruptly widened, the tip short (about 0.095 mm. long), acute, with no serrations. *Male terminalia*: Tergal ratio about 1.1; clasper about 0.3 mm. long, stout basally, flattened apically, the apical part abruptly narrowed, with an acute apex; teeth about at middle; aedeagus at least 13 mm. long.

Type material.—Holotype female, allotype, and paratype (United States National Museum).

Type locality.—Barro Colorado Island, Canal Zone, Panama.

Distribution.—Known only from the type locality.

Food plant.—*Chrysophyllum panamense*.

In addition to the three original specimens, James Zetek has reared this species from the type host four additional times. In two rearings it was associated with *panamensis*, in one being much more abundant, in the other much less so.

ANASTREPHA FRACTURA, new species

(Fig. 18, F)

Rather small, yellow brown. Mesonotum 3.0 mm. long, yellow brown, the humerus, median stripe widening posteriorly, lateral stripe from transverse suture to scutellum, stripe from humerus to wing base below notopleuron, and scutellum pale yellow; metanotum uniformly yellow brown. Macrochaetae brownish black; pile yellowish brown. Sternopleural bristle absent. Wing 6.5 mm. long, the bands yellow brown; costal and S bands touching on vein R_{4+5} ; V band separated from S band, complete except for a break in proximal arm in the middle of cell R_5 . *Female terminalia*: Ovipositor sheath 3.0 mm. long, tapering apically, the spiracles 1.0 mm. from base. Rasper of about six rows of medium-sized hooks. Ovipositor 2.9 mm. long, rather stout, the tip rather abruptly narrowed, without serrations; the shaft at extreme base widened.

Type material.—Holotype female (British Museum).

Type locality.—Kutari Sources, British Guiana.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

The specimen was collected by G. A. Hudson in January–February 1936. Both its wing pattern and ovipositor tip are different from those of any other species known to the writer.

ANASTREPHA LUTEA, new species

(Fig. 19, A; pl. 20, A)

Rather small, orange yellow. Mesonotum 3.0–3.5 mm. long, a slender median stripe widened to include acrostichal bristles, humerus, a lateral stripe from transverse suture to scutellum, and scutellum pale yellow; a stripe below notopleuron, and entire metapleuron, pale yellow; metanotum entirely orange. Macrochaetae black; pile yellowish brown. Sternopleural bristle slender. Wing 7.25–7.9 mm. long, the bands orange yellow and brown; costal and S bands joined for entire width of cell R_5 ; V band separated from S band, the anterior portion pale and the distal arm, posterior to vein M_{1+2} , absent; proximal margin of V band forming a right angle at vein Cu_1+M_3 ; vein M_{1+2} scarcely turned forward at apex but S band extending down around apex of wing to it. Abdomen yellow, with a pair of distinct, transverse, sub-lateral brownish spots anteriorly on tergite 3; anterolateral portions of tergites 2, 4, and 5 faintly brownish. *Female terminalia*: Ovipositor sheath 3.25–3.55 mm. long, tapering to apical third, the spiracles about 1.0 mm. from base. Rasper of rather short hooks in six or seven rows. Ovipositor 2.75–3.0 mm. long, moderately stout, the base abruptly widened, the tip rather short and blunt with no serrations.

Type material.—Holotype female, paratype female (United States National Museum No. 53922).

Type locality.—El Cermeño, Panama.

Distribution.—Known only from the type locality.



FIGURE 19.—Ovipositor tip of (A) *Anastrepha lutea*, (B) *A. galbina*, (C) *A. ludens*, and (D) *A. bondari*.

Food plant.—Unknown.

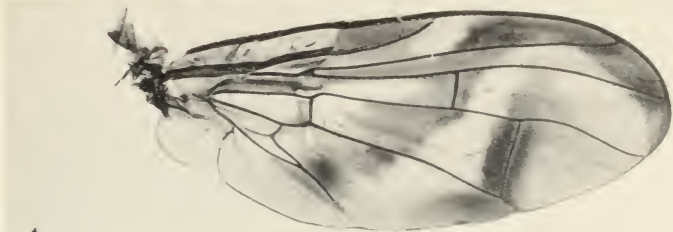
The holotype was trapped October 3, 1939, the paratype December 5, 1939, by James Zetek.

The ovipositor of this species is very similar to that of *teretis*, new species, but the wing pattern is different from that of the latter and all other described species. The abdominal markings are much like those often found in *punctata*.

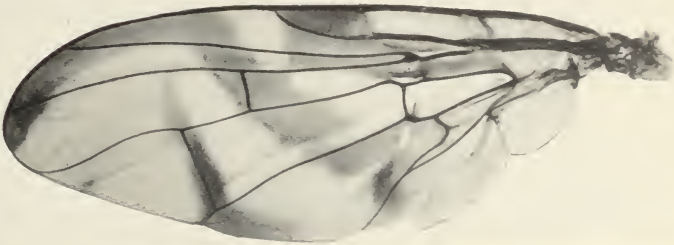
ANASTREPHA GALBINA, new species

(Fig. 19, B; pl. 20, B)

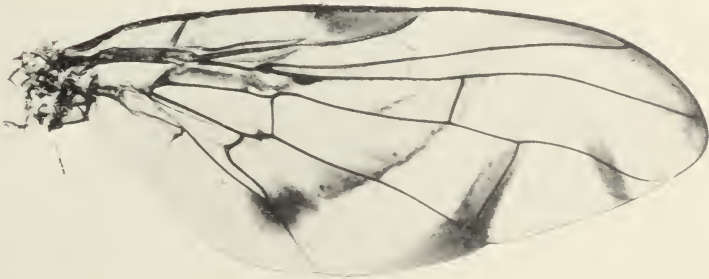
Medium sized, predominantly yellow. Mesonotum 3.4–3.8 mm. long. Thorax yellow, with orange-yellow markings on mesoscutum as follows: A submedian stripe from anterior margin to level of wing base, slightly narrowed posteriorly; a sublateral stripe from behind humerus to scutellum, scarcely separated from submedian stripe, the anterior end widened; a transverse band on scutoscuteellar suture, darkest at middle; metanotum entirely yellow orange. Macrochaetae nearly black; pile yellow brown. No sternopleural bristle. Wing 7.0–8.58 mm. long, the bands yellow and brownish; costal and S bands touching on vein R_{4+5} ; V band slender, separated from S band, the distal arm missing or represented by a small spot at wing margin. *Female terminalia*: Ovipositor sheath 3.95–4.5 mm. long, rather stout, the apical half concave dorsally, the spiracles about 1.2 mm. from base. Rasper of very many slender hooks. Ovipositor 4.0–4.4 mm. long, moderately stout, the tip about 0.557 mm. long, slightly constricted beyond oviduct, with no serrations.



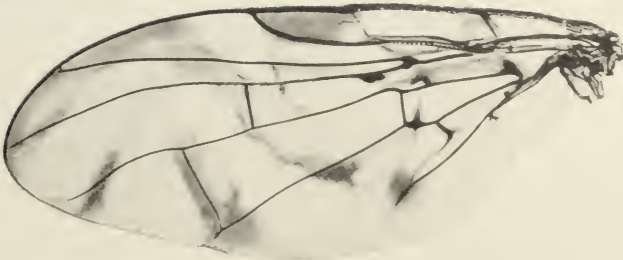
A



B



C



D

Wing of (A) *Anastrepha lutea*, (B) *A. galbina*, (C) *A. ludens*, and (D) *A. bondari*.

Type material.—Holotype female, paratype female (United States National Museum No. 53923).

Type locality.—La Campana, Panama.

Distribution.—Panama.

Food plant.—Unknown.

The specimens were trapped by James Zetek, the holotype November 15, 1938, the paratype at El Cermeño, Panama, October 10, 1939.

The species resembles *leptozone*, but vein M_{1+2} does not turn forward as in that species, and the ovipositor tip is quite different.

ANASTREPHA LUDENS (Loew)

The Mexican fruitfly

(Fig. 19, C; pl. 20, C)

(*Trypeta*) *Acrotora ludens* Loew, Smithsn. Inst. Misc. Collect. 11 (256): 223, 329, pl. 11, fig. 19, 1873.

Trypeta ludens Loew: Riley, Insect Life 1: 45-47, fig. 9, 1888; Johnson, Wash. Ent. Soc. Proc. 4: 56, 1898.

Anastrepha ludens (Loew): Hendel, [Dresden] K. Zool. u. Anthrop.-Ethnogr. Mus. Abhandl. u. Ber. 14 (3): 14, 1914; Greene, Jour. Agr. Res. 38: 495, figs. 2, B, 3, H, 5, B, 6, G, 1929; Dampf, Irrig. en Mex. 7: 254-260, figs. 1, 2, 4, 11, 14, 15, 16, 1933; McPhail and Bliss, U. S. Dept. Agr. Cir. 255, 1933; Emmart, Wash. Ent. Soc. Proc. 35: 184-191, pls. 7-8, 1933; Greene, Wash. Ent. Soc. Proc. 36: 151, pl. 20, fig. 3, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 538, figs. 39-40, pl. 71, figs. 37-38, pl. 75, fig. 61, 1934; Emmart, Wash. Ent. Soc. Proc. 37: 119-135, 1935.

Medium sized, yellow brown. Mesonotum 2.75-3.6 mm. long, yellow brown, a slender median stripe widening posteriorly, humerus, a lateral stripe from transverse suture to scutellum, and scutellum pale yellow; frequently a diffuse brownish spot in middle of scutoscuteellar suture; pleura yellow brown, a stripe from humerus to wing base below notopleuron, and metapleuron, pale yellow; metanotum yellow brown, the sides of the postscutellum darkened, and this color frequently extending down along sides of metanotum. Macrochaetae brownish black; pile pale yellow brown. Sternopleural bristle present, sometimes very slender. Wing 6.6-9.0 mm. long, the bands rather pale yellowish brown; costal and S bands touching on vein R_{4+5} , or narrowly separated; V band separated from S band or very narrowly connected, usually rather pale anteriorly. *Female terminalia*: Ovipositor sheath 3.4-4.7 mm. long, tapering to apical third, which is somewhat expanded and depressed; spiracles 0.85-1.35 mm. from base. Rasper of moderate-sized hooks in five to seven rows. Ovipositor 3.35-4.7 mm. long, moderately stout, the tip elongate, tapering, with rather few, rounded serrations on apical half or less; shaft at extreme base abruptly widened. *Male terminalia*: Tergal ratio about 1.12; clasper about 0.37 mm. long, stout basally, flattened apically; outer margin somewhat convex to the subtruncate apex; inner margin nearly straight; teeth slightly proximad of middle.

Type material.—Holotype male (Museum of Comparative Zoology, Cambridge).

Type locality.—Mexico.

Distribution.—The lower Rio Grande Valley in Texas; Mexico south from Matamoros, Tamaulipas on the east, and Culiacan, Sinaloa, on the west; Guatemala; Costa Rica.

Food plants.—*Citrus grandis*, *C. sinensis*, *C. limonia*, *C. aurantifolia*, *Mangifera indica*, *Casimiroa edulis*, *C. tetrameria*, *Annona cherimola*, *A. reticulata*, *Mammea americana*, *Cydonia oblonga*, *Punica granatum*, *Prunus persica*, *Sargentia greggii*, and *Inga inquil*. It has also been reared experimentally in many other fruits by W. E. Stone in

Mexico City, and what are, with very little doubt, the larvae of this species have been intercepted at the Mexican border from certain other fruits, the most notable of these being deseeded avocados (*Persea americana* Mill.).

The holotype was studied by the writer. This species is the only important member of the genus that is subtropical rather than tropical, occupying the northern portion of the range of the genus and extending southward only at the higher altitudes. The specimens from Costa Rica were reared from *Casimiroa edulis* at San Jose. Reports of the species from Panama are all based on erroneous determinations. Because of its great economic importance the biology of this species is being studied intensively by the Division of Fruitfly Investigations, the most important paper appearing so far being that by McPhail and Bliss, in 1933, on the species in Cuernavaca, Morelos. Emmart has reported on the egg and the chromosomes in 1933 and 1935, respectively.

ANASTREPHA BONDARI Costa Lima

(Fig. 19, *D*; pl. 20, *D*)

Anastrepha bondari Costa Lima, Inst. Oswaldo Cruz Mem. 28: 537, figs. 37-38, pl. 70, fig. 36, pl. 75, fig. 60, 1934; O Campo 8 (90): 34, 1937.

Medium sized, yellow brown. Mesonotum 3.0-3.8 mm. long, yellow brown, the humerus, median stripe expanding posteriorly, lateral stripes from transverse suture to scutellum, and scutellum paler; metanotum uniformly yellow orange, or faintly brownish laterally. Macrochaetae black; pile pale yellow. No sternopleural bristle. Wing 6.7-8.5 mm. long, the bands yellow brown; costal and S bands touching at vein R_{4+5} ; V band separated from S band. *Female terminalia*: Ovipositor sheath 4.2-4.7 mm. long, the spiracles 1.3 mm. from base. Rasper well developed, the hooks in five or six rows. Ovipositor 4.2-4.7 mm. long, stout, the tip at widest about 0.23 mm. wide, constricted, with no lateral serrations; shaft scarcely widened at base. *Male terminalia*: Tergal ratio about 1.28. Clasper about 0.4 mm. long, the apical portion flattened and tapering evenly from both sides to an acute apex; teeth slightly proximad of middle.

Type material.—Cotypes, four females and four males (Instituto Oswaldo Cruz and United States National Museum).

Type locality.—Bahia, Brazil.

Distribution.—Known only from the type locality.

Food plants.—Aca (*Lucuma* sp.), alandy, amora de leite, and guarobeira.

This description is made from a pair of cotypes and 10 female and 8 male topotypes in the United States National Museum.

This species is most closely related to *ludens*, but lacks the dark spots on the postscutellum usually found in *ludens*, and also differs as indicated in the key.

ANASTREPHA TUMIDA, new species

(Fig. 20, *A*; pl. 21, *A*)

Medium sized, yellow brown. Mesonotum 3.0-3.57 mm. long, yellow brown, the humerus, lateral stripe from transverse suture to scutellum, a slender median stripe widening abruptly at level of dorsocentral bristles forming a broad, subquadrate area to include these and the acrostichal bristles, and scutellum pale yellow; pleura yellow brown and pale yellow; mesonotum entirely yellow orange. Macrochaetae nearly black; pile yellow brown. No sternopleural bristle. Wing

7.25–8.3 mm. long, the bands orange brown; costal and S bands touching at vein R_{4+5} ; V band complete, separated from S band. *Female terminalia*: Ovipositor sheath 2.6–3.25 mm. long, moderately stout, orange brown in contrast to the paler yellow, preceding tergites; spiracles 1.1 mm. from base. Rasper of medium-sized hooks in four or five rows. Ovipositor 2.4–3.1 mm. long, rather stout, the base very little expanded, the tip rather short (about 0.16 mm. long), blunt, with a rounded lateral protuberance at level of end of oviduct and with no serrations. *Male terminalia*: Tergal ratio about 1.0: fifth tergite decidedly shinier and usually darker than tergites 1–4, often dark orange brown in contrast to the pale yellow of rest of abdomen; clasper about 0.39 mm. long, stout basally, flattened apically, the apical portion tapering rather evenly to an acute apex; teeth about at middle.

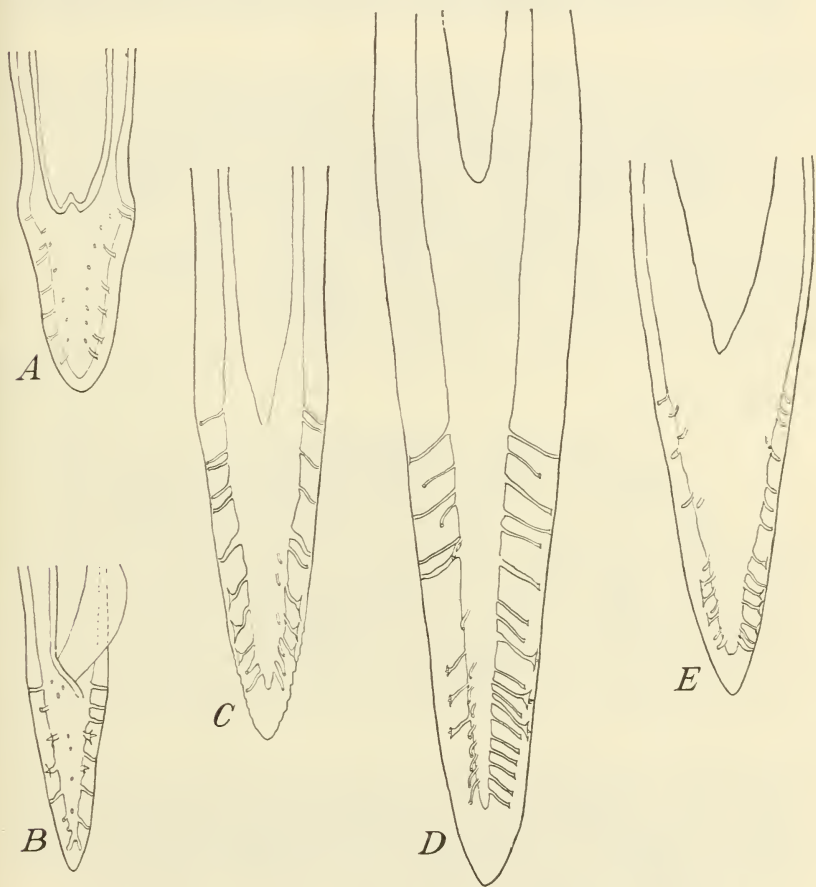


FIGURE 20.—Ovipositor tip of (A) *Anastrepha tunida*, (B) *A. cryptostrepha*, (C) *A. speciosa*, (D) *A. inca*, and (E) *A. sylvicola*.

Type material.—Holotype female (United States National Museum No. 53924); paratypes, 69 females, 46 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—La Campana, Panama.

Distribution.—Panama.

Food plant.—Unknown.

The holotype and most of the paratypes were trapped at the type locality from December to August, the holotype in March 1938 by James Zetek. The others were trapped at Capira (April to July) and at El Cermeño (March to May).

The shape of the ovipositor tip readily distinguishes the female of this species. In the male the shiny fifth tergite is usually quite evident.

ANASTREPHA FENESTRATA Lutz and Costa Lima

Anastrepha fenestrata Lutz and Costa Lima, Inst. Oswaldo Cruz Mem. 10: 8, pl. 2, fig. 19, 1918; Greene, Wash. Ent. Soc. Proc. 36: 169, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 527, fig. 24, pl. 68, fig. 26, 1934; O Campo 8 (90): 38, 1937.

Rather large, yellow brown. Thorax yellow brown, apparently with yellow markings in the usual pattern; no dark on side of metanotum; scutoscuteellar suture somewhat darkened. Pile yellowish. No sternopleural bristle. Wing 9.5 mm. long, the bands dark brown; costal and S bands broadly connected on vein R_{4+5} ; V band complete and broadly joined to S band; S band with a broad posterior projection reaching posterior margin of wing in cell Cu_1 ; apex of vein M_{1+2} just touching apex of S band. *Male terminalia*: Tergal ratio well over 1.0; clasper short and stout; teeth rather near apex.

Type material.—Holotype male (Instituto Oswaldo Cruz).

Type locality.—Amazonia, Brazil.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

This species has not been seen by the writer. The wing pattern is quite distinctive and would permit ready identification of the species if it were found again.

ANASTREPHA SPECIOSA, new species

(Fig. 20, C; pl. 21, B)

Rather small, yellow brown. Mesonotum 3.6 mm. long, yellow brown, the humerus, lateral stripe from transverse suture to scutellum, and scutellum yellowish white; a black band in front of scutellum, extending forward narrowly to include the intra-alar bristles, and having the acrostichal bristles right on its margin; pleura yellow brown and pale yellow; metanotum yellow brown. Macrochaetae black; pile rather dark brown. No sternopleural bristle. Wing 7.3 mm. long, the bands dark brown; costal cell mostly hyaline; costal and S bands broadly joined along vein R_{4+5} ; S band with a narrow posterior projection in cell Cu_1 to the hind margin of the wing, narrowest some distance from wing margin; between this projection and anal vein a rather large hyaline area; V band complete, joined to S band; vein M_{1+2} scarcely turned forward at apex. *Female terminalia*: Ovipositor sheath 4.6 mm. long, tapering to beyond middle, the apical two-thirds, and somewhat more dorsally, dark brown; spiracles 1.2 mm. from base. Rasper of rather strong hooks in five or six rows. Ovipositor 4.6 mm. long, moderately stout, the extreme base abruptly widened, the tip tapering rather evenly, with no serrations.

Type material.—Holotype female (United States National Museum No. 53925).

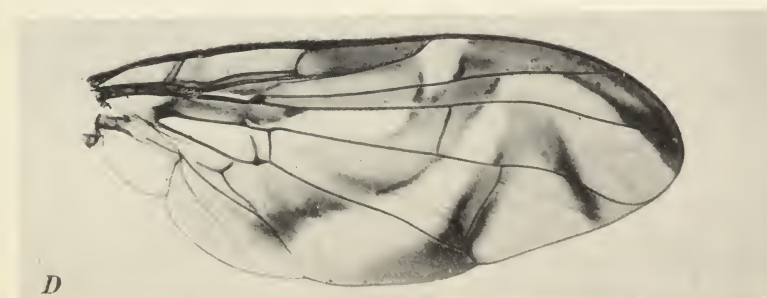
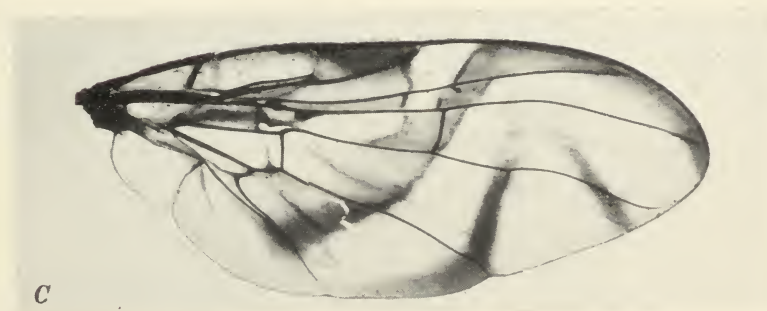
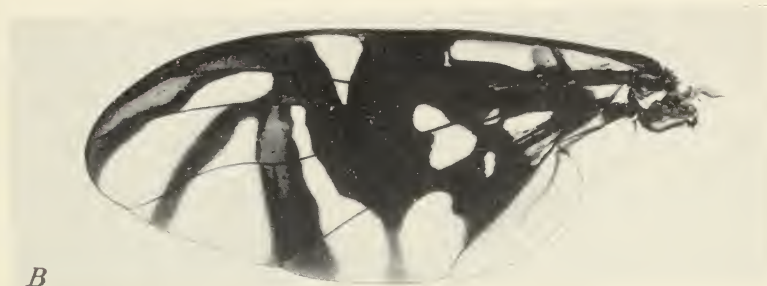
Type locality.—El Cermeño, Panama.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

The single specimen was trapped July 18, 1939, by James Zetek.

The species most closely resembles *fenestrata*, but in the latter the posterior projection from the S band fails to reach the margin of the



Wing of (A) *Anastrepha tumida*, (B) *A. speciosa*, (C) *A. inca*, and (D) *A. sylvicola*.

wing, there is a hyaline spot in cell R_1 below the stigma, and vein M_{1+2} is turned forward to reach the apex of the **S** band.

ANASTREPHA CRYPTOSTREPHA Hendel

(Fig. 20, B)

Anastrepha cryptostrepha Hendel, [Dresden] K. Zool. u. Anthropol.-Ethnol. Mus. Abhandl. u. Ber. 14 (3): 17, pl. 1, fig. 5, 1914; Greene, Wash. Ent. Soc. Proc. 36: 158, pl. 21, fig. 9, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 523, 1934.

Medium sized, yellow brown. Mesonotum 3.2 mm. long, yellow brown, the humerus and scutellum somewhat paler, but with no paler median stripe evident; metanotum entirely yellow brown. Macrochaetae brownish black; pile yellow brown. Sternopleural bristle absent. Wing 7.3 mm. long, the bands brown and yellow orange; costal and **S** bands broadly connected, the hyaline costal spot not quite attaining vein R_{2+3} ; **V** band complete, broadly joined to **S** band; cross vein $r-m$ slightly proximal of the apex of vein R_1 ; vein M_{1+2} scarcely turned forward at margin of wing. *Female terminalia*: Ovipositor sheath 4.5 mm. long, tapering to the slender apical half, the spiracles 1.2 mm. from base. Rasper well developed, of rather small hooks in about four rows. Ovipositor 3.73 mm. long, rather slender, the extreme base scarcely widened, the tip about 0.17 mm. long, with no serrations.

Type material.—Cotypes, female and male (Vienna Museum and Dresden Museum).

Type locality.—Urubamba River, Meshagua, Peru.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

The foregoing description is of a female in the Vienna Museum kindly lent the writer by Dr. Beier, with permission to mount the terminalia. The ovipositor somewhat resembles that of *panamensis*, but is stouter, and the tip is not so short. The **V** band is also separated from the **S** band in *panamensis*. The writer has not seen the male.

ANASTREPHA INCA, new species

(Fig. 20, D; pl. 21, C)

Medium sized to rather large, yellow brown. Mesonotum 3.25–3.57 mm. long, yellow brown; humerus, a median stripe widening posteriorly, lateral stripes from transverse suture to scutellum, and scutellum pale yellow; metapleuron and stripe below notopleuron pale yellow; sides of metanotum blackened, the black widest above. Macrochaetae black; pile yellow, somewhat darker laterally on scutum. Sternopleural bristle slender but distinct. Wing 7.8–8.8 mm. long, the bands yellow orange; in the holotype the costal and **S** bands are barely touching on vein R_{4+5} and the **V** band does not touch the **S** band; in the paratype the costal and **S** bands are connected for a short distance along vein R_{4+5} and the **V** band is narrowly but distinctly connected with the **S** band. *Female terminalia*: Ovipositor sheath 3.58 mm. long, tapered to apical third, the spiracles 1.22 mm. from base. Rasper of rather stout, curved hooks, in six rows. Ovipositor 3.25 mm. long, stout, the tip about 0.64 mm. long, not serrate; extreme base of shaft widened. *Male terminalia*: Tergal ratio 0.93; clasper 0.3 mm. long, stout basally, the apical portion flattened, curved posteriorly, rather narrow, with rounded apex; teeth slightly proximal of middle.

Type material.—Holotype female, paratype male (United States National Museum No. 53926).

Type locality.—Cuzco, Peru.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

The two specimens were collected by G. N. Wolcott, July 14, 1928.

The elongate, nonserrate ovipositor tip is the principal distinguishing character for this species.

ANASTREPHA SYLVICOLA Knab

(Fig. 20, E; pl. 21, D)

Anastrepha sylvicola Knab, Insecutor Inscitiae Menstruus 3:146, 1915; Greene, Wash. Ent. Soc. Proc. 36:159, pl. 21, fig. 5, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28:537, 1934.

Medium sized, yellow brown. Mesonotum 3.0–3.5 mm. long, with indistinct, paler-yellow markings in the usual pattern. Metanotum yellow brown, usually with an indistinct dark spot on each side above. Macrochaetae orange yellow; pile yellow. Sternopleural bristle rather strong. Wing 7.9–8.9 mm. long, the bands yellow brown; costal and S bands narrowly connected at vein R_{4+5} ; V band complete, separated from or narrowly joined to S band. *Female terminalia*: Ovipositor sheath 4.22 mm. long, rather slender, the spiracles 1.15 mm. from base. Rasper of rather short hooks in four or five rows. Ovipositor 4.0 mm. long, moderately stout, scarcely widened at base, somewhat widened at end of oviduct, the tip about 0.31 mm. long, gradually tapering to an acute apex, with no serrations. *Male terminalia*: Tergal ratio about 1.08; clasper about 0.4 mm. long, stout basally, flattened apically, the apical portion with outer margin somewhat concave and tip subtruncate; teeth about at middle.

Type material.—Holotype female, allotype, and paratypes (United States National Museum).

Type locality.—Trinidad, British West Indies.

Distribution.—Known only from the type locality.

Food plant.—Unknown fruit in forest.

This species rather closely resembles *bondari* Costa Lima, but in *bondari* the side of the ovipositor tip is distinctly concave and the tip is shorter.

ANASTREPHA SODALIS, new species

(Fig. 21, A)

Rather large, yellow brown. Mesonotum 3.4 mm. long, orange brown, the humerus, a median stripe gradually widening posteriorly to include the acrostichal bristles, a lateral stripe from just anterior to transverse suture to side of scutellum, and scutellum pale yellow; pleura predominantly pale yellow; metanotum uniformly yellow brown. Macrochaetae black; pile orange yellow. No sternopleural bristle. Wing 9.2 mm. long, the bands yellow orange and brown; costal and S bands narrowly connected on vein R_{4+5} ; V band complete, connected to S band anteriorly. *Female terminalia*: Ovipositor sheath 3.5 mm. long, tapering to apical third, the spiracles 1.0 mm. from base. Rasper of many long, closely set hooks in about eight rows. Ovipositor 3.4 mm. long, the shaft narrowest near the abruptly expanded base, slightly widening to a short distance distad of end of oviduct; tip elongate (about 0.48 mm.), slightly narrowed basally, the apical two-thirds with extremely minute serrations not visible except at a magnification of more than 60 diameters.

Type material.—Holotype female (British Museum).

Type locality.—Santarem, Brazil.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

This species might well be the female of *connexa* Costa Lima, but it would not be safe to consider it as such without definite association of the sexes.

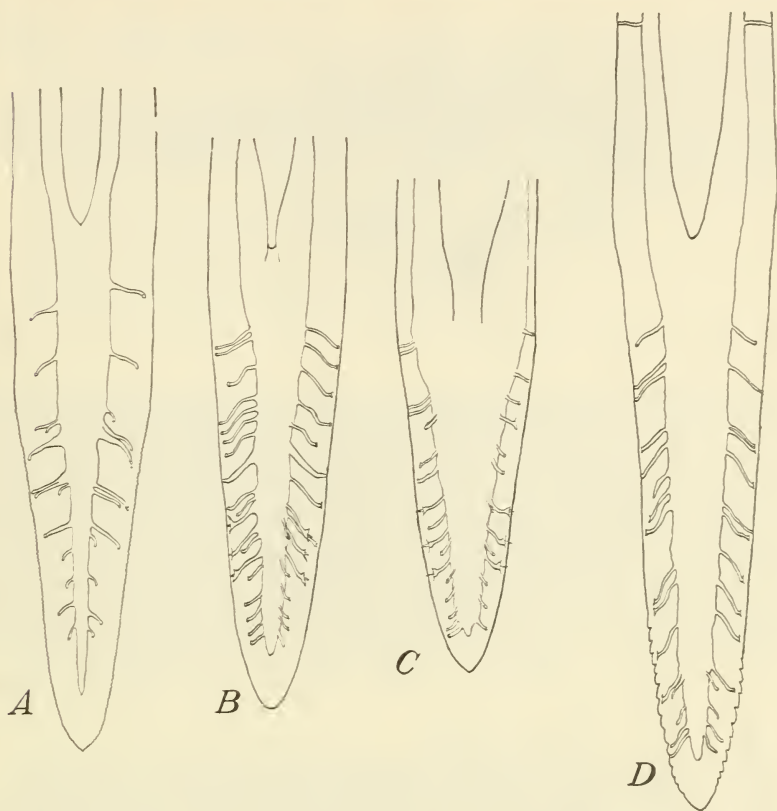


FIGURE 21.—Ovipositor tip of (A) *Anastrepha sodalis*, (B) *A. teretis*, (C) *A. quinae*, and (D) *A. extensa*.

ANASTREPHA TERETIS, new species

(Fig. 21, B; pl. 22, A)

Rather small, yellow brown. Mesonotum 2.8–3.1 mm. long, yellow brown, the humerus, a median stripe widening posteriorly, lateral stripe from transverse suture to scutellum, and scutellum pale yellow; pleura yellow brown and yellow; metanotum entirely yellow orange. Macrochaetae nearly black; pile yellow brown. No sternopleural bristle. Wing 6.5 mm. long, the bands yellow orange and brownish; costal and S bands touching; V band slender, faint or broken anteriorly, separated from S band. *Female terminalia*: Ovipositor sheath 3.75 mm. long, tapering to apical third, the spiracles 1.12 mm. from base. Rasper of strongly curved, rather stout hooks, slightly separated from one another in seven or eight rows. Ovipositor 3.7 mm. long, somewhat curved downward, the base abruptly widened, the shaft widest at apex of oviduct; tip rather elongate (about 0.358 mm.), tapering to the rather blunt apex, with no serrations.

Type material.—Holotype female; paratypes, 2 females (United States National Museum No. 53927).

Type locality.—La Campana, Panama.

Distribution.—Panama.

Food plant.—Unknown.

The holotype was trapped May 30, 1939, by James Zetek; the paratypes were also trapped by Zetek, one at the type locality, June 5, 1939, and one at El Cermeno, May 9, 1939.

The ovipositor of this species rather closely resembles that of *bondari*, but in the latter species the costal and S bands are separated. From those species in which these bands are joined it differs as indicated in the key.

ANASTREPHA QUIINAE Costa Lima

(Fig. 21, C; pl. 22, B)

Anastrepha quiinae Costa Lima, O Campo 8 (90): 37, figs. 7-8, pl. 1, fig. 2, pl. 2, fig. 1, 1937.

Rather small to medium sized, yellow brown. Mesonotum 3.2-3.6 mm. long, yellow brown, with a rather indistinct median pale stripe, expanding posteriorly; humerus, a lateral stripe from transverse suture to scutellum, and scutellum pale yellow; a pale-yellow stripe below notopleuron and another along upper border of mesopleuron; metanotum narrowly darkened laterally. Macrochaetae nearly black; pile yellow to yellow brown. Sternopleural bristle strong. Wing 6.7-7.6 mm. long, the bands yellow brown, all narrowly connected. *Female terminalia*: Ovipositor sheath about 3.5 mm. long. Rasper of stout hooks in five or six rows. Ovipositor 3.2 mm. long, moderately stout, the base slightly widened, the tip about 0.35 mm. long, tapering to a rather sharp point, with no serrations. *Male terminalia*: Tergal ratio slightly less than 1.0; clasper about 0.4 mm. long, moderately stout basally, flattened apically, the apical portion rather broad, somewhat narrowed to a blunt apex; teeth about at middle.

Type material.—Holotype female, allotype, and paratypes (Instituto Oswaldo Cruz).

Type locality.—Bahia, Brazil.

Distribution.—Known only from the type locality.

Food plant.—*Quiina glaziovii*.

The preceding description is based upon four females and four males from Gregorio Bondar, bearing the same rearing number, 2189, as that of the type series.

The species most nearly resembles *distincta*, but in the latter the V band is separated from the S band, and the ovipositor tip is always partially serrate, or at least roughened, laterally.

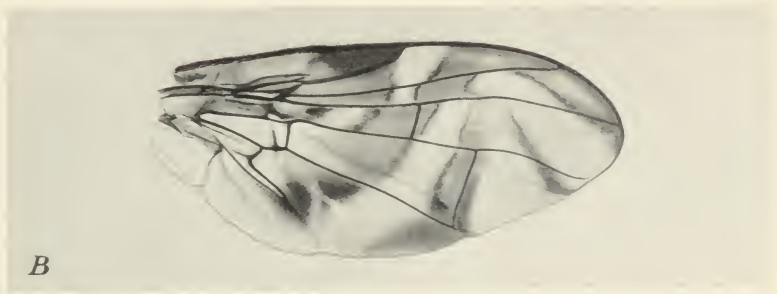
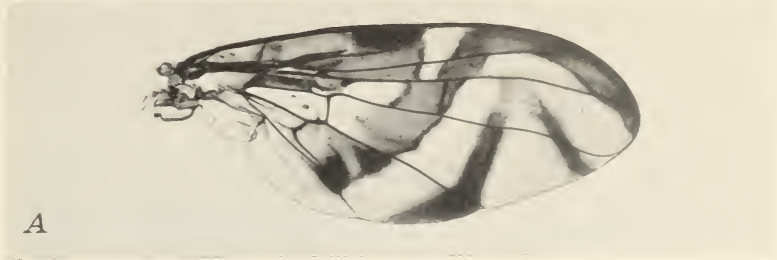
ANASTREPHA EXTENSA, new species

(Fig. 21, D)

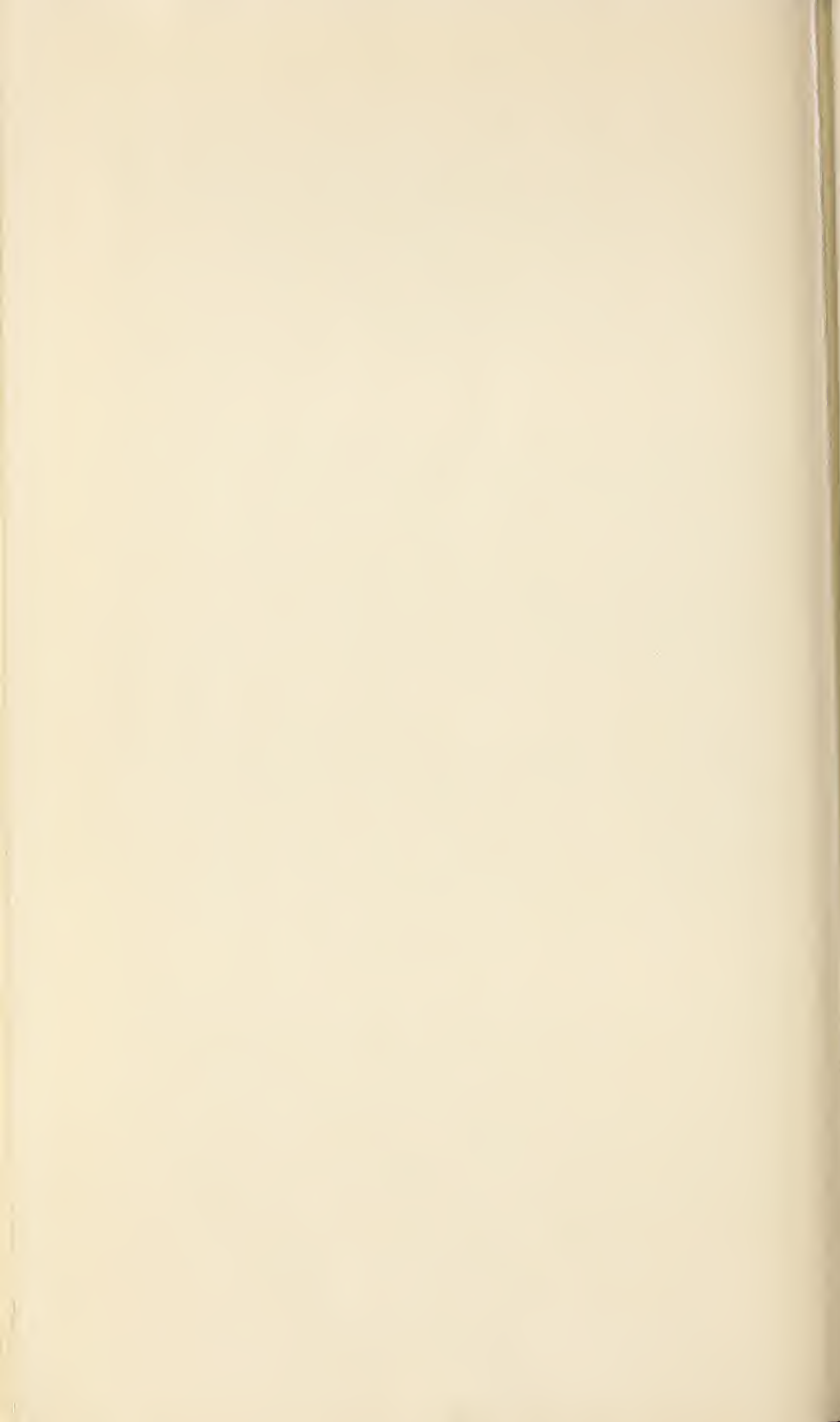
Rather small, yellow brown. Mesonotum about 3.1 mm. long. Thorax yellow brown, the humerus, median stripe widened posteriorly but not reaching scutellum, lateral stripes from transverse suture to scutellum, band below notopleuron, metapleuron, and scutellum pale yellow; no black on metanotum. Macrochaetae orange brown; pile pale yellowish. Sternopleural bristle very weak. Wing 7.25 mm. long, narrowed apically; bands yellow brown; costal and S bands touching on vein R_{4+5} ; V band narrow, separated from S band, and narrowly broken above. *Female terminalia*: Ovipositor sheath 2.5 mm. long, rather stout, tapering from spiracles, which are about 1.0 mm. from base. Rasper consisting of very many long, slender hooks in seven or eight rows. Ovipositor 2.28 mm. long, stout, the extreme base somewhat widened, the tip about one-fourth of total length, with a few minute serrations near apex.

Type material.—Holotype female (British Museum).

Type locality.—Rio de Janeiro, Brazil.



Wing of (A) *Anastrepha teretis*, (B) *A. quinac*, (C) *A. lathana*, and (D) *A. distincta*.



Distribution.—Known only from the type locality.

Food plant.—Unknown.

The single specimen was collected at a light, November 7, 1923, by K. J. Hayward.

The species is rather close to Costa Lima's *silvai* var. *minensis*, but if *minensis* agrees with *distincta* (= *silvai*) in color of the macrochaetae and presence of black on the metanotum, this is distinct. The ovipositor tip would also seem to be slightly longer in relation to the total length of the ovipositor in *extensa*.

ANASTREPHA LATHANA, new species

(Fig. 22, A; pl. 22, C)

Small, yellow brown. Mesonotum 2.1 mm. long. Humerus, median stripe widening posteriorly, lateral stripe from transverse suture to scutellum, and scutellum pale yellow; pleura above and posteriorly pale yellow; metanotum entirely yellow brown. Macrochaetae brownish; pile pale yellow brown. Sternopleural bristle weak. Wing 5.5 mm. long, the bands yellow brown; costal and S bands connected at vein R_{4+5} ; V band complete, narrowly joined to S band anteriorly. *Female terminalia*: Ovipositor sheath 3.08 mm. long, tapering apically, the spiracles about 0.9 mm. from base. Rasper well developed, the hooks in six or seven rows. Ovipositor 2.99 mm. long, rather stout, the tip with 11 or 12 low, rounded teeth on apical half; shaft slightly widened at extreme base.

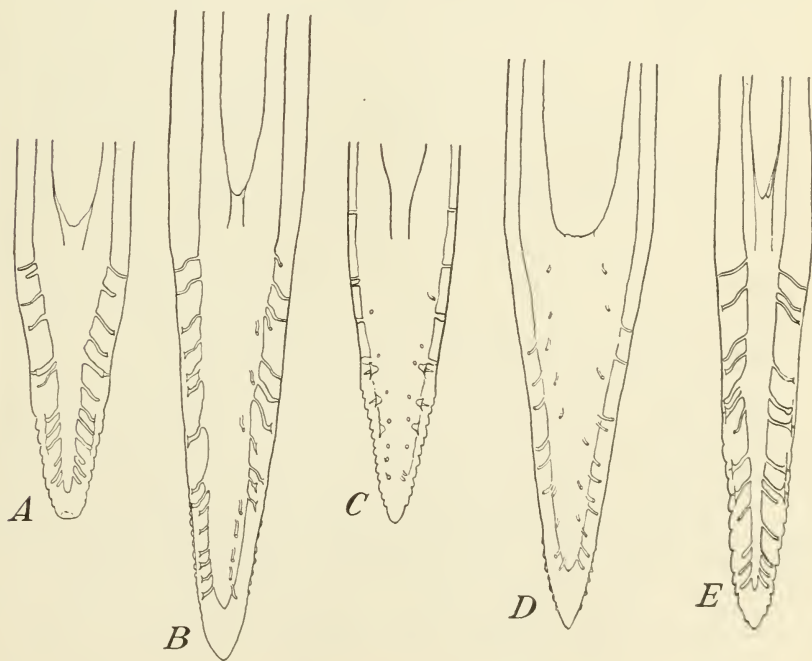


FIGURE 22.—Ovipositor tip of (A) *Anastrepha lathana*, (B) *A. distincta*, (C) *A. bahiensis*, (D) *A. barbiellini*, and (E) *A. macra*.

Type material.—Holotype female (United States National Museum No. 53928).

Type locality.—Cuernavaca, Morelos, Mexico.

Distribution.—Known only from the type locality.

Host plant.—*Psidium guajava*.

The single specimen was reared from guava at Mexico City, September 30, 1936, by W. E. Stone. The species was differentiated by Baker in manuscript under the name here used.

This species is close to *distincta*, but, in addition to the diagnostic characters given in the key, the ovipositor tip of *lathana* is shorter and of a slightly different shape.

ANASTREPHA DISTINCTA Greene

(Fig. 22, *B*; pl. 22, *D*)

Anastrepha distincta Greene, Wash. Ent. Soc. Proc. 36: 149, 1934 (in part).

Anastrepha fraterculus Greene (in part, not Wiedemann), Wash. Ent. Soc. Proc. 36: 164, 1934.

Anastrepha silvai Costa Lima, Inst. Oswaldo Cruz Mem. 28: 545, figs. 49–50, pl. 72, figs. 44–45, pl. 75, fig. 65, 1934; O Campo 8 (90): 34, 1937. (New synonymy.)

Rather small, yellow brown. Mesonotum 2.9–3.6 mm. long. Thorax yellow brown, the humerus, stripe below notopleuron, lateral stripe from transverse suture nearly to scutellum, slender median stripe widening posteriorly but not attaining scutellum, scutellum, and metapleuron posteriorly pale yellow; metanotum somewhat darkened laterally. Macrochaetae dark brown to black; pile yellowish brown. Sternopleural bristle present, slender. Wing 6.0–7.5 mm. long, the bands yellow brown; costal and S bands touching on vein R_{4+5} ; V band complete or narrowly broken anteriorly, separated from S band. *Female terminalia*: Ovipositor sheath 2.3–3.44 mm. long, tapering apically, the spiracles about 0.89–1.22 mm. from base. Rasper composed of many moderately stout hooks in five or six rows. Ovipositor 2.25–3.42 mm. long, the tip long and slender (about 0.35 mm. long), with the serrations minute (sometimes obscured) and confined to the apical half; shaft parallel-sided, the base abruptly widened. *Male terminalia*: Tergal ratio about 1.0; claspers about 0.4 mm. long, stout basally, flattened apically, the outer margin weakly convex, the inner margin distad of teeth nearly straight, the apex narrow but blunt; teeth slightly proximad of middle.

Type material.—Holotype of *distincta*, female (United States National Museum); cotypes of *silvai*, males and females (Instituto Oswaldo Cruz and United States National Museum).

Type localities.—Of *distincta*, Chiclayo, Peru; of *silvai*, Rio de Janeiro, Viçosa, Minas Geraes, and São Paulo, Brazil.

Distribution.—Rio Grande Valley in Texas, Mexico, Guatemala, Costa Rica, Panama, Colombia, Ecuador, Peru, British Guiana, Trinidad, and Brazil. The species has been trapped in Texas from November to April, the peak in January, trapped at the Hacienda Santa Engracia, near Ciudad Victoria, Tamaulipas, in considerable numbers, reared from *Inga* and other hosts and trapped in abundance in Panama, and reared from *Inga* in Mexico, Trinidad, Colombia, Peru, and Brazil. The Brazilian records extend from Bahia to São Paulo. The writer has been informed that sufficient *Inga* fruit is brought into the Rio Grande Valley region to account for the presence of the species there.

Food plants.—*Inga edulis*, *I. feuillei*, *I. goldmanii*, *I. hayesii*, *I. lushnathiana*, *I. panamensis*, *I. punctata*, *I. spuria*, *I. setifera*, *Mangi-*

fera indica, *Chrysophyllum cainito*, and *Eugenia nesiotica*. It has also been reared experimentally by Zetek from *Capsicum frutescens* L. var. *groszum* Bailey, *Solanum donnell-smithii* Coult., *Annona glabra* L., *Dovyalis hebecarpa*, and *Mangifera indica*. This appears to be the only species normally infesting *Inga*, and it almost confines its attack to this genus of plants. The species would well deserve the common name of the *Inga* fruitfly.

Specimens from Peru tend to have a somewhat longer ovipositor than others, but in every other respect there is perfect agreement; and since the species has been reared from *Inga* in Peru, the identity of *distincta* and *silvai* seems certain. The allotype of *distincta* is a female of *fraterculus*. A portion of the material determined by Greene as *fraterculus*, including the specimens reared from *Inga*, is actually *distincta*. The writer has studied cotypes of *silvai*. The species is scarcely distinguishable from *fraterculus* in the male, but in the female the ovipositor is decidedly longer and differently shaped.

ANASTREPHA DISTINCTA var. MINENSIS Costa Lima

Anastrepha silvai var. *minensis* Costa Lima, O Campo 8 (92): 60, fig. 12, pl. 3, fig. 2, pl. 4, fig. 2, 1937.

The writer has not seen this variety, but according to the original description it agrees with the typical variety very closely save that the teeth of the rasper are much more numerous, there being more than a hundred.

Type material.—Holotype female, allotype, and paratypes (Instituto Oswaldo Cruz).

Type locality.—Viçosa, Minas Geraes, Brazil.

Distribution.—Known only from the type locality.

Food plant.—*Myrciaria* sp. (jaboticabeira da mata).

ANASTREPHA BAHIENSIS Costa Lima

(Fig. 22, C; pl. 23, A)

Anastrepha silvai var. *bahiensis* Costa Lima, O Campo 8 (92): 60, figs. 10–11, pl. 3, fig. 6, pl. 4, fig. 5, 1937.

Small or rather small species, yellow orange. Mesonotum 2.4–3.1 mm. long. Humerus, stripe below notopleuron to wing base, lateral stripe from transverse suture to scutellum, median stripe widening posteriorly, scutellum, and metapleuron pale yellow; sides of metanotum black. Macrochaetae black; pile yellowish. Sternopleural bristle distinct. Wing 5.25–6.6 mm. long, the bands yellow brown: costal and S bands usually touching at vein R_{4+5} , but sometimes narrowly separated; V band not connected with S band and usually somewhat faded anteriorly. *Female terminalia*: Ovipositor sheath 1.7–2.1 mm. long, the spiracles 0.6–0.7 mm. from base. Rasper well developed, the hooks in four or five rows. Ovipositor 1.55–1.9 mm. long, the tip evenly tapering, with fine serrations on the apical half or less. *Male terminalia*: Tergal ratio about 0.83; clasper about 0.34 mm. long, stout basally, flattened apically, the tip obliquely subtruncate; inner margin of apical portion nearly straight, outer margin somewhat sinuous; teeth slightly proximad of middle.

Type material.—Holotype female, allotype, and paratypes (Instituto Oswaldo Cruz).

Type locality.—Bahia, Brazil.

Distribution.—Brazil and Panama.

Food plants.—Guarobeira (type) and *Helicostylis poeppigiana*.

The foregoing description is based upon 13 specimens of the same rearing as a portion of the type series (Bondar No. 2196), 2 trapped on Barro Colorado Island, C. Z., 3 at El Cermeño, Panama, and 4 at La Campana, Panama.

While this species resembles *distincta* (= *silvai*), the shortness of the ovipositor seems sufficient to require specific separation. The specimens from Panama appear to have the ovipositor tip slightly longer, with the serrations occupying a relatively shorter portion than in the specimens reared from *Helicostylis*, in this respect more nearly resembling the figure given by Costa Lima, probably drawn from the guarobeira material.

ANASTREPHA BARBIELLINII Costa Lima

(Fig. 22, *D*; pl. 23, *B*)

Anastrepha barbiellinii Costa Lima, O Campo 9 (95): 61, fig. 21, pl. 5, fig. 2, 1938.

Medium sized, predominantly orange brown. Mesonotum 3.1–3.5 mm. long. Humerus, stripe below notopleuron, lateral stripe from transverse suture to scutellum, and scutellum paler yellow, but no median dorsal stripe evident; metanotum uniformly orange brown. Macrochaetae dark brown; pile yellowish brown. Sternopleural bristle weak. Wing 7.3–8.5 mm. long, the bands yellow brown; costal and S bands connected at vein R_{4+5} ; V band complete, not joined to S band. *Female terminalia*: Ovipositor sheath 2.3–2.5 mm. long, the spiracles about 0.85 mm. from base. Rasper with well developed hooks in three or four rows. Ovipositor 2.1–2.5 mm. long, stout, the tip evenly tapering, with a few small serrations on apical fifth. *Male terminalia*: Tergal ratio about 0.83; clasper about 0.37 mm. long, the basal portion rather stout, the apical portion flattened, evenly tapering to a rather acute apex; teeth slightly proximad of middle.

Type material.—Holotype female (Instituto Oswaldo Cruz).

Type locality.—São Paulo, Brazil.

Distribution.—Southern Brazil and Argentina.

Food plant.—Unknown.

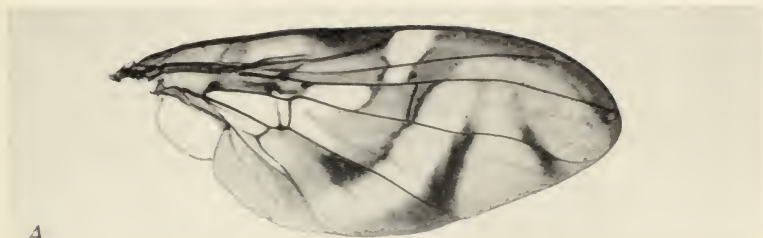
The above description is based upon eight specimens from Nova Teutonia, Rio Grande do Sul, Brazil, collected by Fritz Plaumann, one from Campinao, São Paulo, collected by E. J. Hambleton, and one from Misiones, Argentina. The male is here described for the first time.

This species is close to *bahiensis*, *distincta*, and *lathana*, but is larger and differs from the first two in lacking black on the metanotum, and from the last in having the V band separated from the S band and in lacking a paler median stripe on the mesoscutum.

ANASTREPHA MACRA, new species

(Fig. 22, *E*; pl. 23, *C*)

Rather small to medium sized, yellow brown. Mesonotum 2.95–3.5 mm. long, yellow brown, the humerus, a slender median stripe widening posteriorly to include acrostichal bristles, lateral stripe from transverse suture to scutellum, and scutellum pale yellow; a stripe below notopleuron and entire metapleuron pale yellow; metanotum orange yellow, sometimes darkened laterally. Macrochaetae brownish black; pile yellow brown. Sternopleural bristle very weak or absent. Wing 7.25–7.9 mm. long, the bands orange yellow and brownish; costal



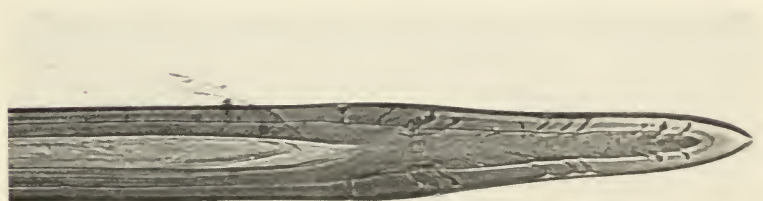
A



B



C



D

Wing of (A) *Anastrepha bahiensis*, (B) *A. barbiellinii*, and (C) *A. macra*; ovipositor tip of (D) *A. tubifera*.



and **S** bands touching on vein R_{4+5} ; the two arms of the **V** band usually separated and slender anteriorly and the proximal arm separated from **S** band. *Female terminalia*; Ovipositor sheath 3.9–4.4 mm. long, tapering to apical third, the spiracles about 1.0 mm. from base. Rasper of well developed hooks in five or six rows. Ovipositor 3.6–4.06 mm. long, slender, the base widened, the tip elongate with minute teeth on the apical half. *Male terminalia*: Tergal ratio about 0.87; clasper about 0.33 mm. long, stout basally, flattened apically, the portion beyond the teeth tapering to an acute apex; teeth about at middle.

Type material.—Holotype female (United States National Museum No. 53929); paratypes, 16 females, 10 males (United States National Museum, British Museum, and Instituto Oswaldo Cruz).

Type locality.—La Campana, Panama.

Distribution.—Panama.

Food plant.—Unknown.

The holotype was trapped December 7, 1938; the paratypes were trapped at La Campana and El Cermeno, Panama, and Balboa, C. Z., from December to February and late April to October.

This species resembles *lathana*, new species, but the ovipositor is longer and the wing pattern is slightly different.

ANASTREPHA LAMBDA Hendel

Anastrepha lambda Hendel, [Dresden] K. Zool. u. Anthrop.-Ethnog. Mus. Abhandl. u. Ber. 14 (3): 13, 17, pl. 1, fig. 3, 1914; Greene, Wash. Ent. Soc. Proc. 36: 164, pl. 22, fig. 4, 1934; Costa Lima, Inst. Oswaldo Cruz Mem. 28: 503, 1934.

Rather large, yellow brown, the thorax marked with black. Frons with a median brown line. Mesonotum yellow brown, with two pairs of black stripes, the inner pair from anterior margin and abruptly truncate posteriorly, the outer pair from transverse suture to scutellum and connected in front of scutellum by a transverse band; disk of scutellum blackish brown. A dark lateral line from humeral callus to wing base; metanotum with two wide, narrowly separated, black stripes. Macrochaetae black; pile orange yellow. Wing 10 mm. long, the bands yellow brown; costal and **S** bands broadly connected on vein R_{4+5} ; **V** band complete, separated from **S** band anteriorly, but joined to it at hind margin of wing. *Female terminalia*: Ovipositor sheath 2.5 mm. long.

Type material.—Holotype female (Dresden Museum).

Type locality.—Pini Pini, Peru.

Distribution.—Known only from the type locality.

Food plant.—Unknown.

The foregoing description is based upon the original one, the species not having been seen by the writer. Its large size, thoracic pattern, and wing pattern serve to distinguish it.

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